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Journal of the Society of Arts.

FRIDAY, MAY 3, 1867.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings at Eight o'Clock:—

May 8.—"On the Recent Inventions and Improvements in European and American Breech-loading Small-arms." By Capt. O'Hea, late 25th Regt. K.O.B.

May 15.—"On New Machinery for Cutting, Tunneling, Quarrying, and Facing Slate, Stone, and Marbles." By W. Fothergill Cooke, Esq.

Cantor Lectures.

The concluding lecture of Mr. Hullah's course, "On Music and Musical Instruments," will be delivered as follows:—

Lecture VIII.—Monday, May 6.

Modern Instruments, Chamber and Orchestral.—The Pianoforte—Combination of Instruments—The Orchestra.

The concluding lectures of Mr. Chaffers' course, "On Pottery and Porcelain," will be delivered as follows:—

Lecture VI.—Monday, May 13th.

English Pottery.—Fulham—Lambeth—Yorkshire—Shropshire—Liverpool—Staffordshire—Etruria—Wedgwood's Wares, &c.

Lecture VII.—Monday, May 20th.

English Porcelain.—Bow—Chelsea—Derby—Worcester—Liverpool—Wales—Plymouth—Bristol—Lowestoft—and other Manufactories—Battersea Enamel, &c.

The lectures commence at eight o'clock, and are open to members, each of whom has the privilege of introducing one friend.

Conversazione.

The Council have arranged for a Conversazione on Thursday evening, the 23rd May, at the South Kensington Museum, cards for which will shortly be issued.

Artizans' Visits to Paris.

The Council of the Society of Arts, feeling the importance of promoting the intelligent study of the Paris Exhibition and the manufacturing establishments in France by artisans of the United Kingdom, have appointed a Committee in furtherance of this object. The following gentlemen constitute the Committee:—

- Rt. Hon. C. B. Adderley, M.P.
- C. W. Aitken.
- Edward Akroyd, M.P., *Vice-Pres.*
- Sir Wm. G. Armstrong, C.B.
- A. S. Ayrton, M.P.
- S. A. Beaumont.
- John Bell, *Memb. of Council.*
- Professor Bentley, *Memb. of Council.*
- Lord Berners, *Vice-Pres.*
- Hon. and Rev. S. Best.
- D. Roberton Blaine, *Memb. of Council.*
- W. H. Bodkin (Assistant-Judge), *Vice-Pres.*
- Sir J. P. Boileau, Bart., *Vice-Pres.*
- R. K. Bowley.
- Antonio Brady.
- Rt. Hon. H. A. Bruce, M.P.
- Decimus Burton.
- C. Buxton, M.P.
- The Earl of Caithness, *Vice-Pres.*
- Lord Eustace Cecil, M.P.
- R. L. Chance.
- Harry Chester, *Vice-Pres.*
- The Masters of the City Companies.
- Henry Cole, C.B., *Vice-Pres.*
- Robt. Coningsby.
- Rt. Hon. W. Cowper, M.P.
- Sir Francis Crossley, Bart., M.P.
- J. Bailey Denton, *Memb. of Council.*
- Lord de l'Isle and Dudley, *Vice-Pres.*
- The Duke of Devonshire.
- Charles Dickens.
- James Easton, *Memb. of Council.*
- C. W. Eborall.
- Lord Ebury.
- Lord Elcho, M.P.
- William Fairbairn, F.R.S.
- Professor Fawcett, M.P.
- Peter Graham, *Memb. of Council.*
- The Earl Granville, K.G., F.R.S., *Vice-Pres.*
- The Earl Grosvenor.
- Mr. Hansard.
- G. W. Hastings.
- Wm. Hawes, F.G.S., *Vice-Pres.*
- J. Pope Hennessy.
- Sir Rowland Hill, K.C.B.
- Chandos Wren Hoskyns, *Vice-Pres.*
- T. Hughes, M.P.
- Blanchard Jerrold.
- Rev. C. Kingsley.
- Hon. A. F. Kinnaird, M.P.
- Lord Henry G. Lennox, M.P., *Vice-Pres.*
- The Bishop of London.
- The Sheriffs of London and Middlesex.
- Rt. Hon. Robt. Lowe, M.P.
- Lord Lyttelton, *Vice-Pres.*
- Archbishop Manning.
- Henry Maudslay, *Memb. of Council.*
- Rev. F. D. Maurice.
- The Lord Mayor.
- J. Stuart Mill, M.P.
- Rev. Dr. Miller.
- The Bishop of Oxford.
- J. Slaney Pakington, *Memb. of Council.*
- Right Hon. Sir John S. Pakington, Bart., M.P., *Vice-Pres.*
- Alderman Sir B. S. Phillips.
- Sir Thomas Phillips, Q.C., F.G.S., *Vice-Pres., Chairman of the Council.*
- The Duke of Richmond.
- Rev. W. Rogers.
- The Marquis of Salisbury, K.G., *Vice-Pres.*
- Titus Salt.
- Sir Francis Sandford, *Vice-Pres.*
- Colonel Scott, R.E., *Memb. of Council.*
- The Earl of Shaftesbury.
- Benjamin Shaw, *Memb. of Council.*
- Sir J. P. Kay Shuttleworth, Bart., *Vice-Pres.*
- S. Smiles.
- Seymour Teulon, *Treasurer.*
- Thomas Twining, *Vice-Pres.*
- Alderman Waterlow, *Memb. of Council.*
- E. W. Watkin, M.P.
- G. Watts.
- George F. Wilson, F.R.S., *Memb. of Council.*
- Vice-Chancellor Sir Wm. Page Wood, F.R.S., *Vice-Pres.*

The Council, on the recommendation of the Committee, have passed the following minute:—

At the last and former International Exhibitions held in this country, arrangements were made by the French Government to facilitate the visits of skilled artizans, and interesting reports on the exhibitions were made by them to their government. Believing that such visits on the part of skilled workmen to these great international displays not only exercise a beneficial influence upon the men themselves, but also upon the progress of industry in the country to which they belong, the Council of the Society of Arts have resolved to raise a fund to be employed in aiding a limited number of English workmen to proceed to Paris for the purpose of studying the present French Exhibition.

To carry this object into effect, they have agreed on the following plan:—

1st. That a number of selected workmen (the number to depend on the amount of funds at the disposal of the Council) shall be assisted to proceed to and remain in Paris a sufficient time (say three weeks), for the purpose of making a careful study of the exhibition, and of such factories and workshops as they may desire to visit.

2nd. That every man so assisted shall, on his return, make a report to the Society of what he has observed during his stay, in reference to the special industry in which he is engaged, and that it be made a condition of the grant to each man that one-third of the amount be retained until his report shall be supplied to the Society.

3rd. The Council think it will be undesirable to fix the exact time for, or to prescribe the duration of, these visits, or to interfere with any of the arrangements the men may desire to make for their own accommodation; but, in order that they may take advantage of the facilities provided by the Commission organised by the French Government for the study of the exhibition, the men will be placed in communication with that Commission on their arrival in Paris.

4th. A considerable sum will be required satisfactorily to accomplish the important object undertaken by the Society, and, in order to raise these funds, the Council have determined to appeal to the members of the Society, who must be interested in the successful results of this movement, in the belief that they will not hesitate to join in a subscription for the furtherance of the undertaking; and they propose at the same time to communicate with the various Chambers of Commerce, inviting their counsel and support. The Council have decided to commence the subscription by a vote of one hundred guineas from the funds of the Society.

The following report has been made by the Secretary :—

To the Council of the Society for the Encouragement of Arts, Manufactures, and Commerce.

Gentlemen,—In compliance with the directions of the Council, I proceeded to Paris for the purpose of ascertaining what arrangements were likely to be available with regard to the lodging and boarding of such artizans as might visit Paris under the auspices of the Society.

I soon found, from inquiries made in various quarters, that little information of any value, as to the probable cost of private lodgings generally, or as to what lodgings would probably be available, was likely to be obtained; indeed, any figures or statements under this head at that time were not likely to be of any use, or in any way to be a guide to the deliberations of the Committee.

The prices asked at that time were exceptionally high, but there was every reason to believe that a reaction would take place, and that, after the exhibition had been open a short time, these prices would diminish.

Mr. Cook, the well-known excursionist, I found was prepared to contract for the lodging and boarding of 50 artizans per week, supplying two substantial meat meals per diem, for 5s. per head per day. I subsequently placed myself in communication with M. Le Play, the General Commissioner of the Exhibition, who informed me that a Special Commission had been formed, under a ministerial decree, for effecting the very objects I was in search of, and he gave me a special letter of introduction to the Chairman of that Commission, Mons. Devinck, formerly President of the Tribunal of Commerce for the Department of the Seine, and I had two interviews with that gentleman. It appears that the object of this Commission is to raise, by subscription or otherwise, funds for facilitating the visits to the exhibition of foremen, workmen, or labourers connected with industrial and agricultural pursuits, and for enabling them to study the exhibition in all its aspects.

The Commission proposes to raise a fund (to which the Emperor and Empress have subscribed largely) in order to provide lodging and board at a cheap rate for artizans, to assist workpeople in their travelling to and from Paris, and to supply gratuitously medical aid in case of sickness. Mons. Devinck informed me that the Commission expected to have under their control five thousand beds. These are situated in different parts of Paris and the outskirts. They have had placed at their disposal large buildings and barracks, and some of a temporary character have been specially erected in the neighbourhood of the exhibition, which will be furnished suitably for the purpose, and beds will be arranged in the rooms, four and upwards in each room. In one of the buildings it is said that several hundred beds will be placed in one room.

Arrangements are made for breakfasts and dinners on a large scale and at a cheap rate, in a building erected for the purpose, with access to the Champ de Mars, where 1,000 persons can take refreshments at one time.

These arrangements, more especially those for aiding workmen gratuitously in their travelling expenses, were intended for French workmen, but at the same time all the organisation of the Commission is intended to be available for the workmen of other countries.

It is also intended that guides, speaking English and such other languages as may be necessary, shall be provided to conduct the men over such workshops as they may wish to visit. M. Devinck stated that on receiving notice a sufficient time beforehand, the Commission would be prepared to provide lodging for such men as might be sent over and recommended to their consideration by the Society of Arts, at a payment of one franc per night per head. Their breakfasts—a substantial meal of meat—and dinners would be obtainable in the building I have before named, at one franc per head for each meal.—I am, &c.,

P. Le Neve Foster, Secretary.

P.S.—Since writing the above, I have received the following tariff of prices at the restaurant referred to in my letter:—

Grand Restaurant Omnibus, Parc de l'Exposition (Avenue Lamotte-Piquet).

Prix des objets de consommation.

Pain	0fr.	10c.
Vin, le carafon	0	15
Bière, la chope	0	25
Bouillon	0	15
Potage	0	20
Bœuf	0	25
Légumes	0	20
Fromage	0	15
Café avec eau-de-vie	0	30
Roti *avec légumes*	0	40

On peut demander un seul des objets de consommation ci-dessus mentionnés.

Le consommateur, en apportant son pain, peut se procurer pour 0fr. 40c. l'*ordinaire* (bouillon et bœuf).

Members are invited to aid the Council in this undertaking by subscriptions, which should be forwarded to the Financial Officer at the Society's house.

The Council have received offers of co-operation from a Committee for promoting cheap excursions to the Exhibition, formed under the auspices of the "Working Men's Club and Institute Union," and of which Mr. A. H. Layard, M.P., is President, and Mr. Hodgson Pratt, Vice-President. This Committee has issued a notice to the effect that working-men may travel "to Paris and back, with one week's lodging," for 30s., or "with meat breakfast and superior bed accommodation," 44s. 6d. They estimate the total expense of stay (for one week), journey, and Exhibition ticket, at £3. Registration tickets, and every information relative to these excursions may be obtained from the Secretary, Mr. W. O. Pocklington, at 150, Strand, and at various Working Men's Clubs and Institutes.

HARVESTING OF CORN IN WET WEATHER.

The Council of the Society of Arts have resolved to offer the Gold Medal of the Society, and a Prize of Fifty Guineas, for the best Essay on the Harvesting of Corn in Wet Seasons.

The first part of such essay—after noticing the various systems at present adopted in damp climates for counteracting the effects of moisture upon cut corn in the field, and for avoiding such exposure in wet seasons by peculiar harvesting processes—should furnish a practical and analytic exposition of the best available means :—

1st. Whereby cut corn may be protected from rain in the field.
2nd. Whereby standing corn may, in wet seasons, be cut and carried, for drying by artificial process.
3rd. Whereby corn so harvested may be dried by means of ventilation, hot air, or other methods ; with suggestions for the storage both in the ear and after threshing.
4th. Whereby corn, sprouted, or otherwise injured, by wet, may be best treated for grinding or feeding purposes.

The whole to be supplemented by a statement of practical results, and actual cost of each system described ; and authenticated estimates of any process proposed for adoption, based upon existing but incomplete experiments.

The above requisitions are given suggestively ; not to bind the writer to the order or to limit the treatment of the subject, provided it be kept within the scope of practical experience and utility.

The essays must be sent in to the Secretary of the Society of Arts on or before the 1st of January, 1868.

The Council reserve the power to withhold the whole or part of the prize, in the event of no essay being, in the opinion of the judges, of sufficient merit.

SUBSCRIPTIONS.

The Lady-day subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

FOOD COMMITTEE.

A meeting of the Sub-Committee on Meat was held on the 3rd ult., at which there were present—The Right Hon. Henry Austin Bruce, M.P., in the chair; Mr. Clare S. Read, M.P., Mr. Benjamin Shaw, Mr. Michael, Mr. J. Ludford White, Mr. Jas. Ware, Professor John Wilson, and Mr. E. Wilson.

Dr. ALFRED S. TAYLOR attended the Committee, on the invitation of Mr. Benjamin Shaw, and he brought for the inspection of the Committee a tin case of preserved provisions which had formed part of the stores of H.M.S. *Blonde*, in the year 1826. The tin was opened in the presence of the Committee. An account of its condition, drawn up by Dr. Taylor, will be found at the conclusion of his evidence.

Dr. TAYLOR, in reply to inquiries put by the Committee, stated he was not aware of the precise method by which this specimen of provisions just opened had been preserved. It had no doubt been preserved by raising the meat in the tin to a somewhat high temperature, obtained by immersing the tin in a bath of boiling brine, and hermetically sealing the tin by means of solder whilst the steam was rushing out, and thus preserving the contents in vacuo. The process was the same as that now in use, though probably not effected at that time with the same care which is now used. The necessity for the perfect exclusion of air from the meat was shown in the instance before them by the rapidly oxydising effects of the air upon the contents of the tin. In a few hours decomposition would take place. Allowance, however, was to be made for the extreme length of time that had elapsed. There were certain points to which attention must be paid in connection with the artificial preservation of meat. His investigations had been directed in the first instance to the circumstances connected with the decomposition of animal substances and the best means of preserving meat for the purpose of food. Putrefaction of animal and nitrogenous principles used as food resulted from three primary causes, viz., 1st, air, by supplying oxygen ; 2nd, water, or moisture ; 3rd, a temperature above 50°. These were the three main conditions. All that need be done in preserving animal matter was to find out which of these conditions could be completely suppressed or put aside. With regard to air, putrefaction was arrested by heating the substance in close vessels, and the exhaustion of the air would be facilitated by the vacuum process by heating at a low temperature, as was done by vacuum pans in the manufacture of sugar. Putrefaction was also arrested in animal substances by gases or vapours which contained no free oxygen—such as nitrogen, carbonic acid, and chloroform, or by the use of gases which combine with and remove free oxygen, such as deutoxide of nitrogen (nitric oxide) and sulphurous acid. The latter, being very soluble, is liable to be absorbed by the flesh, and to act chemically upon the colouring matter, taste, &c. He had tried various experiments in the preservation of slices of beef in nitric oxide, which was very effectual in preventing putrefaction. In the first experiment he kept the meat for eighteen weeks, in a second for nineteen weeks, in a third for thirty-two weeks, and in a fourth for eighteen months, from October 27th, 1862, to March, 1864. During these periods the flesh was exposed to two of the conditions of putrefaction, viz., moisture and high temperature. The summer was very warm. This gas is remarkable in this respect, it will not allow free oxygen to come into contact with it. At the end of the eighteen months the meat retained its red colour and appearance, although it was exposed during the whole time to the varying temperatures of the laboratory. The simple abstraction of the oxygen was sufficient to preserve the meat completely. This process, although not practically applicable for preserving food, was useful in showing that oxygen is the main agent of destruction. Keep that away, and the other two conditions are of no importance. That applied to the preservation of food in tins, from which air was excluded by exhaustion by heat, and also to Redwood's process, in which the substance was imbedded in paraffine. In the latter case the meat was preserved like the flesh of the Egyptian mummies, and the material in which it was enclosed got into the flesh and excluded the oxygen. Then, with regard to moisture. If the water were taken away from the most putrescible matter it could be preserved for a long time. Dr. Taylor produced a specimen of white of egg from which the moisture had been removed in a vacuum, by the aid of dry chloride of calcium. In that way he said the albumen was dried to the gummy matter now presented, forming about one-fifth of the original albumen; but with the addition of four parts of water it could be restored to its original state again. This proved that substances which would putrefy in warm weather in twenty-four hours, yet if the water were taken away, although there were the conditions of oxygen and high temperature, they would undergo no change. Desiccation might be mentioned as another means resorted to in the preservation of food, as was seen in the instance of the tongues imported into this country from Archangel and other parts of Russia. These were slightly salted, and smoked by being suspended in chimnies over wood fires, and so thoroughly desiccated that they would remain good in warm or cold climates for almost any length of time. Dr. Taylor placed a specimen of a dried Russian tongue before the Committee, and explained that an ox tongue could be detected from that of a horse by the difference in the form of the epiglottis of the two animals. When the epiglottis remained on the tongue it might be inferred whether it was that of an ox or a horse, while the removal of that portion from the tongues imported into this country might create a suspicion that they were the tongues of other animals than the ox. These tongues, Dr. Taylor explained, on being soaked in water for twenty-four or thirty-six hours, regained very nearly the original quantity of moisture of which they had been deprived by desiccation. He learnt from his friend beside him (Dr. Gwosdew, of Moscow, a Russian physician) that with a temperature below 40°, although oxygen and moisture were present in the substance, there was no tendency to decomposition, so that meat buried in the soil below 40° might be kept good for months. This plan was resorted to for preserving provisions in the Arctic expeditions. The provisions were buried in the frozen earth, the positions being indicated by stones placed over them, and after many months they were found to have undergone no change. Dr. Taylor then went on to state the principles to be observed in the preservation of animal food. These were—

1. No chemical compound to be used, with the exception of salt, and that only in small quantity.

He thought the use of salted meat, in the way it was ordinarily understood, was not desirable, because it hardened the meat, and rendered it more or less indigestible, and there were no means by which the chemist could get the salt out again. Salt in large quantity added to the insolubility of the meat. A small quantity of salt was beneficial in the preservation of food, as chloride of sodium added to the other principles tended to prevent the growth of fungi. The next point was—

2. The fleshy portion, drained of blood, to be selected; only those portions to be taken which are in a sound state, and as soon after death and cooling of the body as possible.

The draining away of the blood was a point of great importance, because there was no portion of the body so prone to decomposition as the blood; hence, butchers were careful to drain the blood from the animals they slaughtered as much as possible. It was therefore desirable that the portions of flesh intended for preservation should be entirely free from blood, on account of the albumen it contained, which was easily decomposed. One of the first effects of decomposition was mustiness, which spoilt the taste of food—so that in getting rid of the blood we get rid of matter which was most prone to decomposition. On the point of selecting only those portions which are in a sound state, he would remark that in many instances, there could be no doubt, bad consequences had resulted from placing unsound meat with the sound. It was well known that when animal matter affected by decomposition was placed in contact with fresh matter, it tended to set up decomposition throughout the whole mass. That was a most essential point, which should be considered by those by whom the food was prepared. On the point of the preparation of the flesh as soon after death and cooling of the body as possible—this was desirable on account of animalcula setting up changes in the body which tended to putrefaction. It was therefore desirable that the meat should be preserved as soon after the cooling as possible, to prevent any incipient stage of putrefaction. Microscopic observation detected those incipient changes on the mucous surfaces of the flesh, and that threw light upon the necessity of not allowing this change to begin. The next point was—

3. The portions selected to be partially cooked, *i.e.*, heated to about 170° for a short time, in order to coagulate the liquid albumen.

In the case of some of the artificially preserved meats now in use, Dr. Taylor observed that they were subjected to a temperature of 220° or 240°; that, he believed, was the case in Redwood's process. By that means the meat might be said to be overcooked for the purpose of food. In order to preserve meat for food it was important that the original properties of the meat should be retained as much as possible. The primary object was not to cook the meat entirely, but merely to preserve it. He suggested the heat of 170°, for this reason, that the albumen, which was the most easily decomposable principle in the flesh, was solidified at that temperature without destroying the properties of the meat. He submitted that the temperature which would fix the fluid albumen viz., 170°, was sufficient for preservative purposes, and the fibrine and gelatine were at the same time retained unchanged. The time during which the meat should be subjected to a temperature of over 170° should be regulated according to the size of the joint, but the temperature should not be raised beyond that. When meat was exposed to a heat of 240° for half or three-quarters of an hour, it necessarily followed that the fibrine was hardened or corrugated, and the meat was brought into a condition less easy of digestion, as well as forming less palatable food. In making hashes and minces of meat, if it was allowed to boil at a high temperature for an hour or two, the meat was converted into a hard fibrous material, which was very indigestible, whereas, if it had been maintained at a temperature of not more than about 170°, at a slow simmer, the meat was soft and good. He thought even the temperature of 212° was too high in such cases. Meat preserved at a temperature of 170° or 180°, could be cooked to completion when required, with the addition of a little salt. Meat exposed for any considerable length of time to a temperature of 220° or 240° must be considered as overcooked. The inside of a mutton chop or beef steak when broiled underdone, and in which all the juices of the meat were retained, did not reach the temperature of 170°, but only reached that point at which the blood and albumen contained in the flesh were coagulated. He considered it preferable to subject the meat to be preserved to the lower temperature of 170° for a long period, rather than to the high temperature of 240° for a very short time. With regard to the next point, he said—

4. The meat to be introduced into tins in the usual way, and the whole of the air excluded by partial exhaustion or by heat. The absence of any free oxygen is an essential point.

It occurred to him that the exhaustion of air from the tins might be effected in a very satisfactory manner by the use of vacuum pans, like those employed in the manufacture of sugar, invented by Howard, consisting of two large copper pans in which complete exhaustion was effected. Exhaustion by the air pump could not produce more complete results than was done in reference to the tin case of preserved provisions of 1826, by heating alone. Looking to the large component part which the flesh of animals forms in the food of this country, it occurred to him as a further point—

5. The tongue and heart drained of blood and laid open, and the liver sliced and drained of blood, might be preserved by slight salting, heating to 170°, and then perfect desiccation by drawing over these parts a current of warm air.

These portions of the viscera of animals readily admitted of perfect desiccation, and in that state might be sent to this country from very long distances, and would form an excellent and nutritious article of food. The only thing with regard to the liver was that it contained fatty matter which, in the process of drying, would exude, and probably give a disagreeable appearance to the surface. He had preserved portions of the human liver for years in his laboratory by thorough desiccation. In this mode of preserving food he apprehended the packing in air-tight vessels would not be required. He believed the partial cooking of the meat at the temperature of 170° would to a great extent exclude the air; but he would add exhaustion as a completing process. The next point he would submit was—

6. Either by the entire removal of oxygen, or the entire removal of moisture, the tendency to putrefaction is destroyed and the food is preserved. The desiccated food may have its properties restored by immersion in salt and water for one or two days.

This point, he said, was sufficiently illustrated in the case of soaking dried tongues in water previous to cooking.

7. The process of desiccation will not answer for fat meats, as the fat will appear as oil upon the surface. It may not answer for the sliced liver, but this should be made the subject of experiment.

The membranous portions of fat were apt to become rancid from the albumen becoming decomposed, and produced mustiness. This gave rise to the mustiness that was found in stale suet. There was no objection to fat free from membrane, but it was not desirable to preserve the fat of the heart and tongue. In travelling in Italy he recollected that an excellent dish, consisting of sheeps' hearts stuffed with savoury herbs, &c., was frequently served in the Italian restaurants. It was good and digestible food, as the fibres of the heart were less tough than those of the other muscles of the body. The concluding point he submitted was—

8. In preserving meats it will be desirable to remove as much as possible the blood and also the fat, and to take care that a heat of 170° is attained and not exceeded. The parts only of healthy animals to be selected.

These leading principles in the preservation of food, Dr. Taylor remarked, would, he hoped, be some little help to the Committee in the consideration of this subject.

The Chairman asked Dr. Taylor whether he considered these principles had been more or less disregarded in the methods of preservation hitherto employed.

Dr. Taylor replied that he had not given much attention to the examining of tins of preserved food, but from general scientific knowledge he should say they had been to some extent disregarded. He thought it probable that sufficient care had not been exercised with regard to putting unsound meat with sound; and there was reason to believe that was the case in some of the provisions supplied to the army during the Crimean war, by which the whole contents of the cases were spoiled. It was also to be apprehended that proper means were not always taken to exclude air. The test of complete exhaustion of air was the indentation of the top and bottom of the tin, while the undue convexity of the tin was an indication of the presence of gases generated by decomposition of the animal substance within the tins.

Mr. Shaw, in reference to Dr. Taylor's suggestion that the meat should be prepared at a low temperature, inquired whether he thought Tindal's system was defective in regard to the high temperature employed in his process?

Dr. Taylor replied in the affirmative. The meat was overcooked in the first instance. The object should be to apply no more heat than would suffice for the preservation, and afterwards to apply the cooking. He had no doubt the high temperature employed in Tindal's process was adopted from a belief that it was necessary for the preservation of the food, and from the fact not being generally known that the albumen in meat was coagulated at a temperature of 170°. The excessive temperature of 220° or 240° consolidated the albumen to an extent which made it indigestible. Dr. Taylor did not think that experiments upon Tindal's meat, or other meats preserved in the same way, could be satisfactorily tried by artificial digestion with pepsine, or by giving it to animals and examining the results. If the pepsine, for instance, were taken from the stomach of a sheep, he should object to that being taken at all, the digestive principle of a herbivorous animal differing very greatly from that of a carnivorous animal. There was no doubt that the stomach of a dog would digest the meat with the greatest ease. If the experiment could be tried on human beings it would be preferable. Experiments, however, of a comparative character might be tried, one with the albumen coagulated at the temperature of 170°, and another when it was coagulated at a much higher degree of temperature. It was surprising what the effect was of boiling a piece of beef at a high temperature for a long time; it became hard and fibrous. He did not say it was wholly indigestible by the human stomach, but it was not by far so digestible as meat heated and cooked at a much lower temperature. The object was to obtain that which would suit the stomachs of 99 people out of 100, and in that view he was of opinion that the high temperature employed in Tindal's process was not only unnecessary, but prejudicial to the nutritive properties of the food.

The Chairman asked if a different amount of cooking would be required in meat partially cooked as Dr. Taylor had described.

Dr. Taylor replied it would be in the condition of a joint of meat which was partly cooked on Saturday to keep it good till Monday, when the process of cooking was completed. It would be treated as partially cooked meat. A certain amount of cooking was necessary at the place where the preparation of the meat was carried on—say Australia or South America—but he submitted than an excessive amount of cooking was unnecessary. Tindal's meat was thoroughly cooked, and required to be eaten cold as taken from the tins. Any further heating or cooking on its arrival in this country, he apprehended, would materially affect its flavour and act prejudicially on its nutritive properties, and frequently re-cooked food does not suit the stomach. The partially cooked food he recommended would obviate that. He believed a temperature of 170° entirely excluded air, and the meat was not injured either in its flavour or preservative qualities. Food so prepared would keep good for two or three years. The want of flavour which characterised the meat which he tasted at Mr. Shaw's house was very apparent. It occurred to him that in Tindal's process some of the savoury matters of the meat were volatilised, which probably might be retained at a lower temperature. The effect of excessive boiling or heating of meat to a high temperature had a most prejudicial effect in driving out the nutritive properties and retaining only the indigestible muscle and insoluble fibre of the flesh.

Professor Wilson suggested that if the temperature were not carried above the point of evaporation, or 212 degrees, there would not be so perfect a vacuum as if the atmosphere were replaced by an atmosphere of steam.

Dr. Taylor said no doubt that would be so, but the 170 degrees might be continued for some time without prejudicing the quality of the meat, and the cooking could be completed when it was required for use. That, he thought, would, in a great measure, meet the objection which had been stated by a member of the Committee against the present form of the Australian food. If the system were carried out on a large scale, it would be advisable, in order to exhaust the air from the tins, to adopt the vacuum-pan as used in the manufacture of sugar, as by this means a vacuum would be obtained without heating to 212 degrees.

The Chairman asked Dr. Taylor whether he thought there were advantages in the system of preparation he recommended, as compared with sending the meat, if it were possible to do so, to this country, as fresh meat, wholly uncooked?

Dr. Taylor replied he was inclined to rely upon the plan he suggested rather than upon the hope of importing the meat in an uncooked and fresh state. The only means of preserving meat in a raw state was either by the application of chloride of sodium or chemical gases, and in the use of the latter agents there would be great popular prejudices, however innocuous the gases might be. There was an objection to the use of gases which were soluble in water, for this purpose. The other points on which he had prepared information to lay before the Committee, were as to the results of experiments in the drying of meats. The lean of beef contained 69 per cent. of water, and only 31 per cent. of dry solids; the average might be taken as 66 per cent. of water in the meat of beef. In drying these meats they might get rid of the whole of the water except a little which might hang about the tissues. He doubted whether they could get it all back again, but if they did so to an extent so as to make the meat soft, that was all they need look to practically. In the instance of a dried tongue, if instead of getting back the 66 per cent. of water by soaking, they could only get back 40 or 50 per cent., still the meat was eatable in that state. With regard to oysters, it was astonishing how many a person could eat of them, because they contain an enormous proportion of water. The solid residue of an oyster was less than 20 per cent. The analysis of an oyster was as follows:—

Solid organic matter, dry	19·02
Mineral ash, chloride of sodium phosphates	0·87
Water	80·11
	100·00

Thus, in five oysters eaten, four would be water and only one solid. The constituents of bread were—

Water	38·5
Solid residue, starch, dextrine, and gluten	61·5
	100·0

In estimating the nutrient power of food the quantity of water it contained should always be borne in mind.

In reply to the inquiries of the Committee on the subject of extracts of meat,

Dr. Taylor stated he had made examinations of the several extracts proposed on the system of Liebig, Gillon, and Tooth. Liebig's *Extractum carnis* is a stiff paste, of yellowish brown colour, having a strong meaty odour, quite soluble in cold water, like an aqueous extract of animal matter, with a slight acid reaction. The solution is of a dark brown colour. Boiling makes it clearer. It contains no albumen or fibrin, these being insoluble in water at a high temperature. These principles are lost in the manufacture of the extract, and thus only $\frac{1}{10}$th of the solid matter of flesh is obtained while $\frac{9}{10}$ths are lost, so that it could scarcely be called *Extractum carnis*, that term implying "flesh." It contains only that portion of flesh which is soluble in boiling water, and this would be a principle analogous to gelatine, but Liebig disputed the presence of gelatine in his extract. The gelatinization of a decoction on cooling depends upon whether there is a certain per-centage of animal matter present; less than two per cent. would not gelatinize the food, and the gelatinous properties might also be destroyed by the process of heating in the manufacture of the article. The extract made a good soup in combination with other matters, and was well fitted for an addition to other foods. All extracts were open to this objection—that the greater part of the nutrient matter was really left behind; 34 lbs. of flesh, containing nearly 24 lbs. of water, yielded only 1 lb. of extract. For meat of poor quality this process was applicable, but for good meat the retention of the fibrin and albumen was desirable. The extract in question amounted to a good quality of beef tea, and was good as far as it went, but it did not supply the nutritive qualities which were required in animal food. The flesh-producing properties of food in the human body depended upon the solid constituents of meat, of which more than 60 per cent. was proved to be water. There was no process that he was aware of by which more of the nutrient properties could be obtained in the extract than was already obtained under Liebig's system. It could not be regarded as an article of food *per se;* and the price at which it was sold was prohibitory to its extensive use in this country. In respect of the substitution of vegetable albumen for that of animal albumen which was wanting in the extract, it was to be borne in mind that all vegetables contained a very large amount of water—in some cases as much as 80 to 90 per cent. Potatoes contained from 70 to 80 per cent. of water; and in regard to all kinds of food it practically came to this—what amount of solid matter did it contain? The extract of meat made a good food in combination with vegetables, but it would never take the place of solid animal food. On the subject of Gillon's Essence of Beef, Dr. Taylor stated that a sample, which was procured from Bell's, of Oxford-street, in August, 1866, was examined by him in March, 1867. It was, he said, quite liquid, of a pale yellow colour, with a meaty odour. It was not gelatinous; it had a slight acid reaction. It did not become coagulated on boiling, but was copiously precipitated by tannic acid; acetic acid had no effect upon it. It contained a small quantity of alkaline chloride (sodium), but no lime or sulphuric acid. It had a pleasant taste, like beef tea. When evaporated it gave off the odour of meat, without any ammonia. Some flaky matter was deposited; it darkened in colour, and left a brown residue; this residue when burnt had the smell of animal matter, and gave off nitrogen and sulphur; the ash left after burning contained much alkaline phosphate, chiefly phosphate of potash. An ounce of it by measure weighed 488 grains. It was constituted in 100 parts of:—

	In 100 parts.	In 1 lb.
Animal extractive	5·8	406 grs.
Mineral ash, phosphate of potash	1·4	98
Water	92.8	6,496
	100·0	7,000

It contained about $\frac{1}{16}$ of its weight of solid matter of a nutritious kind, or equal to about 1 oz. in 1 lb. of extract, so that a man must have a very capacious stomach to make a really nutritive meal off these extracts. Dr. Taylor added that he had brought with him analyses of infusions of black tea and coffee. The infusion of tea was that made by his servants, and pretty strong. An ounce of it by measure weighed 448 grains. On evaporation it left a brown-coloured extract, which, when heated, gave off nitrogen and some sulphur, with tarry matter. In 100 parts it was thus constituted:—

	In 100 parts.	In 1 lb.
Vegetable extractive, including ash, containing nitrogen and sulphur	0·6	42 grs.
Water	99·4	6,958 „
	100·0	7,000 „

Thus there was of solid matter only 2·88 grains in a cup of infusion of tea.

An analysis of a strong decoction and infusion of coffee showed the constituents to be—one ounce in measure, weighing 480 grains:—

	In 100 parts.	In 1 lb.
Vegetable extractive, tannic acid, &c., &c., containing nitrogen and sulphur	3	210 grs.
Water	97	6,790 „
	100	7,000 „

In addition to the above, Dr. Taylor laid before the committee the following results as to loss of weight in meat cooking:—

	Boiling. Per cent.	Roasting. Per cent.	Baking. Per cent.
Beef	20·5	32	30
Mutton—Legs	20	—	—
„ Shoulders	31	—	—
„ Loins	35	—	—
„ Necks	32	—	—

More was lost by roasting than boiling. In all cases, from $\frac{1}{5}$ to $\frac{1}{8}$ the weight of meat was lost by cooking.

Examination of a Tin Case of Provisions Preserved for Forty-one Years.

The tin case formed part of the stores of the *Blonde* frigate, which went on a voyage to the Sandwich Islands in 1826. On her return, a portion of her stores came into the possession of the late Mr. Thomas Hamlet, jeweller, of No. 1, Princes-street, Leicester-square. In 1831 he gave to me two tin cases of provisions from the stock of the *Blonde*, for the purpose of a chemical examination. They remained in my laboratory at Guy's Hospital until about the year 1846, when one of them was opened before the Chemical class at the hospital. Its contents were found to be in a good state of preservation. They were partly liquid, and partly solid. Before a chemical examination could be made, the contents of the tin case were eaten by some of the Hospital attendants. The smell and taste of the more liquid portion were like those of a rich soup, and I could only make the further observation that they were slightly acid in reaction. The hospital attendants ate the contents without being aware that they had been kept for so long a period, and, as I was informed by my late assistant, they were pronounced to be good.

The remaining tin case was kept in the laboratory. under all the variable changes of temperature, until April 3rd, 1867, and, after a lapse of *forty-one years*, it was opened in the presence of the Food Committee of the Society of Arts. The tin on the outside of the case had perished, and the rim had become rusty, and in many parts very thin. In one part at the top there was the appearance of a comparatively recent crack in the metal. No fluid had leaked out, but air may have slightly penetrated. On removing the cover, there was no ammoniacal or other offensive odour. The contents were solid, compact, and had sunk for almost an inch below the level of the case. A large portion of the upper surface, opposite the part in which there was the appearance of a crack, was covered with a layer of white and red mould. This was removed, and below it there was a thick stratum of a fatty substance, white, very soft, and without any offensive smell. The contents were turned out, and there were large masses of meat like beef, surrounded by and imbedded in the fat. When a section of it was made, the meat presented a red colour, and had a fresh appearance, but by exposure to the air it became rapidly of a brown colour. The meat had an appearance as if it had been cooked; there was no unpleasant odour, but it had lost all meaty flavour.

Within a few hours after the tin case had been opened, I made a chemical and microscopical examination of the contents. The fatty portion was soft like thin lard. It presented no membranous appearance. It had no offensive odour; it readily melted by the application of heat, and evolved ammonia. The melted fat had a well marked acid reaction. It dissolved in a strong solution of potash when heated, evolving much ammonia, and producing a soapy liquid. The chemical properties of the fat had undergone but little change. It resembled adipocere in containing ammonia, but it differed from it in its appearance, and in being fusible at a much lower temperature. The ammonia which it contained was not sufficient to give it that soapy character which has been assigned to adipocere.

The fibre of the meat was very soft, and, by slight pressure, it was converted into a pasty mass. Under the microscope, the fibrous structure of the meat was very well marked, but the striped appearance of recent muscular fibre was not clearly distinguishable.* It retained in a very distinct form the red colouring principle of the blood (myochrome). When a portion of the red fibre was mixed with the tincture of guaiacum and peroxide of hydrogen, it speedily gave to the guaiacum resin that bright blue colour which has been described by Schönbein as one of the properties of the colouring matter of blood. Comparative experiments were made with some raw as well as boiled meat. Both of these turned the guaiacum of a blue colour (but only by contact with peroxide of hydrogen), while the cooked meat, which had been stewed for some hours, acted more slowly, and did not produce so intense a blue colouration as the fibre of the preserved meat. The oxidizing property manifested on this resin by fresh muscular fibre was thus proved to be possessed by this meat after so long a period. This showed that the myochrome or colouring matter of the blood had not been materially changed in it.

The meat, when boiled in water for some time, was not entirely dissolved, some fibre remaining. The solution, which was opaque, was slightly acid, and had a disagreeable odour. It gave off ammonia, and this was greatly increased when a small quantity of potash was added. The fibre of the meat was then entirely dissolved, forming a reddish-brown solution. When the alkaline solution was treated with oxide of lead, the dissolved fibrine was found to contain a quantity of sulphur.

The aqueous solution contained only a trace of alkaline chloride (common salt). It was copiously precipitated by tannic acid, corrosive sublimate, chloride of platinum, and sub-nitrate of mercury,—in all these respects resembling a solution of gelatine which had lost the power of setting into a jelly by cooling. Acetate of lead, and nitroprusside of sodium produced no change of colour.

The fibre was entirely dissolved by cold glacial acetic acid. This solution was precipitated by potash, and the precipitate redissolved by an excess of the alkali, in these respects resembling the fibrine of flesh, but, owing to its altered molecular state, this meat fibre was much more soluble. When a portion of the meat fibre was submitted to destructive distillation, it evolved a large quantity of ammonia and sulphur—chiefly as sulphide of ammonium. Lead paper was blackened, red litmus paper was rendered blue, and the nitro-prusside of sodium, when exposed to the vapours, acquired a rich crimson red colour.

When the contents of the tin case (meat and fat) had been enclosed in a bottle for an hour, there was an offensive smell like that of decomposing animal matter. Test papers were applied, with the appropriate tests, to detect ammonia, sulphuretted hydrogen, and phosphuretted hydrogen, but there was no indication in half an hour of any of these offensive gases escaping from the substance.

The general conclusion from this examination is, that the contents of the tin case consisted of meat and fat which had probably been partially cooked but not salted, or only to a slight extent; that the fat and meat retained their chemical properties, but had undergone physical changes in a softening of their substance. These had not been sufficient, however, to affect materially the colour or the distinctly fibrous character of the meat. Small quantities of ammonia were present in the fat and fibre, but these were only indicated by the application of heat. Both had an acid reaction on test paper; this was stronger in the fat than in the lean portions. An upper layer of fat had tended to preserve the meat, and the preservation was aided by the close and compact manner in which the contents had fallen together. The growth of white and red fungi—the former apparently the *penicillum candidum*—shows that at some period, as a result of the rusting of the metallic case, air had obtained access to the contents. The white fungus was accompanied by a crop of a bright, brick-red looking fungus.

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* My colleague, Dr. Moxon, Professor of Pathological Anatomy in Guy's Hospital, subsequently made a more minute microscopical examination of another portion of the fibre, and he states that he found the structure most perfect. The striped markings observed in the recent fibres of the voluntary muscles were very distinctly seen. This affords another proof of the perfect preservation of the flesh after so long a period, namely, that even its microscopical characters had undergone no change.

It could not be expected that the contents of a tin case, whatever process of preservation may have been used, would be fit for food after the lapse of forty years. The result, however, has a scientific interest in reference to the processes employed for the preservation of food. Out of the three conditions required for the decomposition of animal matter—namely (1), access of free oxygen (air), (2) the presence of moisture, and (3) temperature—the only one not brought into operation here was the first. There is every reason to believe that, when originally prepared, the oxygen of air had been completely excluded from the interior of this tin. There was abundant moisture in the material when opened, and, with regard to temperature, the case had been kept under all variations of summer and winter temperature over a period of forty years. No chemical substance, so far as one could judge, had been used for the preservation of the contents. The quantity of common salt was very small. The food had no doubt been partially cooked and then rapidly sealed up in a vessel made air tight. These results would point to the sufficiency of partial cooking, and the perfect exclusion of oxygen in a free state, for the preservation of the flesh of animals now wasted in South America and in some of our colonies. That mode of preservation, carefully carried out, which allowed the fibre of meat to retain most of its chemical properties for a period of forty years, will, of course, operate with efficiency for two, three, or five years, and, practically speaking, so long a period as this would scarcely be required. The destruction of the tinned iron case by oxidation on this occasion also leads to another suggestion, namely, that these cases should be coated with a thick layer of paint, or asphalt varnish; the latter would be preferable. These might be renewed when the provisions are required to be kept for a long period.—ALFRED S. TAYLOR.

April 5, 1867.

The Committee have received, through the courtesy of Lord Stanley, Her Majesty's Secretary of State for Foreign Affairs, a report drawn up by the legal adviser to her Majesty's Embassy at Paris, and addressed to Lord Cowley, relative to the provisions, action, and effect of the French laws against frauds by adulteration, or by the use of false weights and measures in the sale of food in France, together with the text of the laws themselves. These documents, of which the following are translations, were forwarded to the Committee, in reply to the letter addressed to Lord Stanley, which appeared in a recent number of the *Journal* (see page 305):—

Paris, March 7, 1867.

MY LORD,—Your Excellency has asked me what are the provisions of the French law against frauds in the sale of provisions, whether by adulteration or by false weights or false measures. You have, moreover, desired to have explanatory details upon the action and effect of these penal regulations.

I have the honour to send you annexed:—1st. The text of Article 423 of the Code Pénal; 2nd. The text of the law of the 27th March, 1851, the special object of which is the strict check upon deceit in quality and quantity in the sale of goods. The comprehensive terms of these enactments include the punishment of all kinds of frauds. The law does not undertake to define fraud; it leaves that to the discretion of the judge, founded on the facts which come before him. Frauds are as ancient as dealings between men. The Roman law contains many very severe laws upon frauds committed in the sale of goods. The laws of the middle ages against fraud in commerce are very numerous. In our modern legislation since 1789 we find a number of repressive laws, some general, some special, such as those affecting gold stuffs, velvets, cloths, soaps, trade marks, butchers, bakers, &c.

All these laws are in force, and are often applied. In the place of these laws, Article 423 of the Code Pénal can be resorted to, which punishes, in a general manner, all deceit in quality and quantity of goods sold. The decision of the courts has stamped the character of fraud on all acts which affect the genuineness and purity of food. Thus are punished as fraudulent—mixing corn brandy and beetroot brandy with pure Cognac, and selling it under that name; the addition of water to wine and to milk; the sale, under the name of cashmeres, of materials fabricated without the use of the cashmere goat; the sale of artificial mineral waters in place of natural mineral waters; or of all other pharmaceutical productions not genuine. This list might be extended without end, but it is only necessary to repeat that the courts are absolute judges as to what amounts to fraud. They take into consideration fraudulent intention, the illegality of the profit, the tricks of the sellers, and the prejudices of the buyers. It must, however, be added, that the courts have never punished certain mixtures authorised by commercial use, such as the mixture of strong with weak wines to improve the latter; the law only attacks adulterations. The mixture of sugar from the potatoe with sugar from beet root, or from the cane, is a punishable adulteration. Leeches which have been used, and which are sold as fresh, are considered in the light of adulterated goods, and so is also the sale of damaged corn, &c. Article 3 of the law of 27th March, 1851, punishes even the possession of false weights or false measures, or the adulteration of food; and if the food contains noxious substances, the penalty is greater. This provision of the law, however, is not new. It may be found in the books of the Hebrews, in the laws, and in numerous edicts of the middle ages, when all trade guilds had regulations with regard to weights and measures and the quality of the goods. The law of 27th March, 1851, includes all tricks by which the buyer does not get his full weight; thus the weighing of provisions with a very thick paper, though intended as a wrapper, is a fraud in quantity. In a word, it is necessary that the quantity should be exact, though a slight deviation is allowed, of which the court are the sole judges as to what is right, in the same way as they judge of actual frauds and attempts at frauds—for attempts at frauds are equally punishable with frauds themselves.

I will now pass on to the manner in which these penalties are determined and prosecuted, and finish with a few words on the effect of these laws. The surveillance of frauds is confided to the prefects, the sous-prefects, to the mayors, and to the deputies of these officers. It is also confided to the commissioners of police, to the verifiers of weights and measures, to the comptrollers of the warranty of gold and silver materials, and to the officers of revenue. All these functionaries put the law in force, under the authority of general rules, or local rules emanating from municipal authorities; they make, unexpectedly, visits of inspection and verification; they have power to make domiciliary visits. When they meet with an infringement of the law they make out a written report of the case, which is forwarded to the Procureur Impérial, a magistrate charged with the prosecutions of all infractions of the law. The Procureur Impérial summons the delinquents before the police-court, which pronounces the penalty. This is a public proceeding and the duty of a public officer, but there is besides the private action, which every one can bring for damages he has suffered; it is thus that cheated buyers can summon the sellers before the police-court and claim damages for the injuries sustained, unless the Procureur Impérial has obtained them in addition to the punishment. It must not be forgotten that all the legal agents for the prosecution of offences have taken an oath to fulfil faithfully their duties, which renders their testimony worthy of credit; but there is besides the immediate seizing of all things which have aided the fraud. This seizing, which allows the Court to judge by its own tribunals the reality of the crime, is a powerful means of controlling the execution of the law by the agents. If the tribunals have not sufficient knowledge themselves to judge the offence, for example, mixing, in an article of food, strange or noxious substances disputed by the delinquent, they can order a report and require the aid of experts before giving their decision. The trial always takes place before the tribunal of the district where the offence has been committed. The delinquents can defend the prosecution by all the means in their power, such as their good faith, their ignorance, their inexperience in commercial matters, which may be considered as extenuating circumstances, as in all other criminal matters; they can also plead limitation, which is for three years, the same as for other crimes. The two penalties under this law are fine and imprisonment, the scale of which varies according to the gravity of the offence; the terms of the law in this respect are very explicit. Fine is pronounced independently of the damages and restitution which the courts have power to order. The fine is paid to the Treasury; the damages and restitution are given to the injured parties. Amongst the most efficacious penalties is that which orders the judgment to be affixed upon the walls of the street and on the delinquent's door, or the publication of the judgment in the newspapers. Judgment given in matters of fraud in goods may be appealed from by means of opposition appeal and the petition to the *Cour de Cassation* on the ground of being contrary to law. The law of 27th March, 1851, has had for its principal end the prevention of frauds in innumerable cases which occur with regard to provisions; the laws previously in force had been found insufficient in many cases; the foreign commerce of France suffered much from these frauds, which had been constantly denounced in the French Parliament; in 1849, in the single department of the Seine, comprehending Paris and the towns of St. Denis and Sceaux, there were 6,702 complaints of frauds, which were brought before the lower tribunals of police, for want of precision in the old law (article 423 of the Code Pénal), and in the absence of the law of 1851, which was made especially to protect the interests of the working classes, who are the first victims of fraud. This law was much discussed in the legislative assembly. Certain speakers feared lest a facility for such prosecutions should fetter freedom of trade, whilst it was admitted that unchecked fraud is a great embarrassment in matters of business. We do not willingly deal with those countries where fraud is common. A special law of 23rd May, 1857, has extended the provisions of the law of 1851 to drinks, and this was much required. The effect of this active repression has been, as shown by criminal statistics, that the large number of prosecutions and condemnations have led to the diminution of frauds. The following figures are given:—From 1840 to 1850 the number accused of cheating in quantity or quality of merchandise never rose to more than 350 per annum, prosecuted under the old article 423, of the Code Penal; in 1851 the number rose to 4,383 accused, of whom 1,028 were condemned to prison, and 2,862 were fined under the provision of the law of March 27th, 1851; in 1853 there were 7,353 accused, 1,811 of whom were condemned to prison, and 4,724 were fined; in 1858 there were 7,014 accused, 1,639 were imprisoned, and 4,742 were fined; in 1864 only 3,406 were accused, 794 were sent to prison, and 2,470 were fined—a great diminution in the number of accused. It results from these figures that the prosecutions have been very frequent, but also that from 1850 to 1864 there has been an important improvement. The agents of the law never relax in their prosecutions; there is not a week in Paris without numerous condemnations, above all in the retail trade; but, in spite of the vigilance of the authorities, frauds are still numerous, especially as regards quantity, whilst adulterations have considerably diminished. The mixture of noxious matters is especially tending to disappear. The greatest number of condemnations are found to be in additions of water to wine and milk. I hope your Excellency will not consider these explanations too long, and that they will facilitate the understanding of the dry text of the law.

I have the honour to be, &c.,
(Signed) Treite.

To His Excellency Earl Cowley, &c., &c., Her Britannic Majesty's Ambassador at Paris.

Text of the French Laws against Adulteration and the Sale of Alimentary Products by False Weights and False Measures.

Article 423 of the Code Pénal.

Whoever shall have deceived the buyer in matters of gold or silver, in the quality of a false stone, sold for a real one, in the quality of all goods; whoever, by use of false weights and measures, shall deceive as to the quantity of articles sold, shall be punished by three months' imprisonment at least, a year at most, a fine, which must not exceed one-fourth of the value and damage, nor be less than 50 francs. The fraudulent articles or their value, if they still remain in the possession of the seller, will be confiscated, and, moreover, destroyed.

The court can order the judgment to be posted in such places as it may name, and order its insertion in full, or an extract from it, in all the newspapers, and at the expense of the condemned.[*]

Special Law of 27th March, 1851.

Article 1.—The following offenders come within the terms of the above article:—

1st. Those who adulterate alimentary or medicinal substances intended for sale.

2nd. Those who sell, or who offer for sale, alimentary or medicinal substances knowing them to be adulterated.

3rd. Those who deceive, or attempt to deceive, as to quantity the persons to whom they sell or of whom they buy, by the use of false weights, or by false measures, or by false instruments, used for weighing or measuring, or by tricks or plans tending to falsify the operation of weighing or measuring, or augmenting fraudulently the weight or size of the merchandise, even before the weighing or measuring, or by fraudulent indications leading to a belief in a previous exact weight or measure.

Article II.—If in the cases provided for by Article 423 of the Code Pénal, or by Article I. of the present law, a question arise that the offence shall relate to the mixture of articles noxious to health, the fine shall be from 50 francs to 500 francs, unless the fourth of the restitutions and damages exceeds the latter sum. Imprisonment shall be from three months to two years. The present article shall even be applicable to those cases where the injurious adulteration shall be known to the buyer or consumer.

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[*] This latter clause has been added only since 1863, by the law of 13th May. N.B.—The penalties pronounced by this article can be mitigated by the Court, when they find extenuating circumstances in favour of the accused; the tribunal can, in this case, reduce imprisonment to six days, or only impose a fine.

ARTICLE III.—Those who, without lawful reason, shall have in their warehouses, shops, workshops or houses of business, or in the markets or fairs, either false weights or measures or other incorrect apparatus, for weighing or measuring either alimentary or medicinal substances, knowing them to be adulterated, shall be punished by a fine of 16 francs to 25 francs, and be liable to an imprisonment of from six to ten days, or one of these penalties only, according to circumstances. If the substance adulterated be injurious to health, the fine may be increased to 50 francs and the imprisonment to fifteen days.

ARTICLE IV.—When the accused, convicted of breaking the present law, or Article 423 of the Code Pénal, shall have been, in the five years which precede the offence, condemned for breaking it before, the penalty shall be increased to double the maximum. The fine pronounced by Article 423 and by Article I. and II. of the present law, may even be raised to 1,000 francs if the half of restitution and damage does not exceed that sum. The whole of this law is to be read without prejudice to the application of Article 57 and 58 of the Code Pénal.

ARTICLE V.—The objects the sale of which, or the use or possession of which, constitute an offence, shall be confiscated, in conformity to Article 423 and to Articles 477 and 481 of the Code Pénal. If they are applicable for food or medicinal use, the Court can hand them over for the use of charitable institutions. If they are improper for use or hurtful, they will be destroyed at the expense of the condemned. The Court can order that the destruction shall take place in front of the establishment or house of the condemned.*

ARTICLE VI.—The Court can order the judgment to be affixed in places it designates, and the full insertion or mere extracts in all the journals it names, all at the expense of the condemned. (This penalty is much dreaded.)

ARTICLE VII.—Article 463 of the Code Pénal will be applicable to offenders provided for by the present law.

ARTICLE VIII.—Two-thirds of the produce of the fines are handed over to the Communes where the offences take place.†

CANTOR LECTURES.

"ON MUSIC AND MUSICAL INSTRUMENTS." By JOHN HULLAH, ESQ.

LECTURE VII.—MONDAY, APRIL 29.

MUSICAL INSTRUMENTS. — (*Continued.*)

After briefly reminding his audience of some points in his last two lectures, delivered before Easter, Mr. Hullah said that the bow, to which he should now have to direct their attention, ought to prove an interesting as well as an important subject, for no mere mechanical appliance had ever made so many and such important changes in an art as the bow had made in music. Strangely disproportionate sometimes, however, is what is said about a thing to the thing itself. The poets of modern Europe seem never to weary in singing the praises of the lyre, the lute, the psaltery, and the harp—instruments, three of which no one living has heard, while the remaining one was only exceptionally brought in to the orchestra. Yet which of them has adorned the violin with an epithet worthy of its power, sweetness, infinitely variable intonation, flexibility, and, more than all, power of expression? The violin, to one who has thoroughly mastered it, has ceased to be an instrument, however sensitive and responsive to his touch; it has become rather a part of his own organism—another member—an additional arm. Like a living thing, too, the violin has its humours, its waywardnesses, its good and bad moments. It resents ill-usage. Handled for some hours by an incompetent player, stopped out of tune and bowed badly, it will take time to recover its capability for correct intonation. The imaginative inhabitants of the south of Europe attribute to it a soul. Our sound-post is called in Italy *l'anima*, and in France *l'ame*. The characteristics of the violin family are the finger-board and the bow. As Mr. Hullah had said before, the former was a very ancient invention, certainly known to the Egyptians. Its existence is in no way dependent on that of the bow; and the bow existed long without association with the finger-board. This association, however, when brought about, enormously increased the value of both contrivances. The history of the bow — the time and place of its first application to a string—has afforded matter for much controversy. In investigating the origin of anything—invention, custom, or word—our thoughts involuntarily turn at first to the East; but in the instance of the bow we get little satisfaction, hardly even material for speculation, from that quarter. Instruments of the violin kind have been found in the East, but chiefly in those parts which have been directly subject to European influence; so that it seems quite as likely that the Hindoo or the Polynesian have taken these instruments from us as we from them. No one is bound to prove that the bow was not an Eastern invention. The onus rests with those who think it was, and their only means of raising it seems to be conjecture. The authentic history of the violin is altogether European. The earliest representation known of an approximate one (a copy of which was exhibited) is in the *De Cantu et Musica Sacra* of Gerbert. Gerbert assigned it to the end of the eighth century. The instrument represented has but one string, but in other essentials it is a violin, with a tail-piece, a bridge, two sound-holes, and something like a finger-board. The bow rests on the string, and the portion of the (right) hand shows that it was held like the violin of to-day. There is proof, however, that, anterior to the eighteenth century, a bowed instrument, having three or more strings, was well-known in the north, and not unknown in the south, of Europe. It was called in England a crowd, and in Wales (beyond which it cannot be traced) a crwth. Two drawings of this instrument, of different dates, were then exhibited. They varied in the number of strings, and in some other respects, but were indisputably representations of the same kind of instrument. The bridge of one was nearly, and of the other quite, flat, which of course prevented the bow touching one string without touching two or perhaps all of the others, indicating that the earliest bowed instruments were used for the production not of melody, but of harmony, however rude that might have been. If this was so, it established the fact that the use of the bow and the treatment of combined sounds grew up together, and that the cradle of both was the north of Europe. The earliest mention of the crwth yet found is in an elegy addressed to Loup, Duc de Champagne, about the year 570, by Venatius Fortunatus, who, in the same passage had first used the word harp. The passage might be rendered thus:—"Let the Roman applaud thee with the lyre, the barbarian with the harp, the Greek with an heroic strain, let the British crwth sing." There the instrument is spoken of (by an Italian) as British, and (as Mr. Chappell has acutely remarked) distinguished from the three others as capable of producing sustained sounds, like the voice. From the Celtic crwth come the mediæval words *rota* and *rote*, which are not derived from the Latin *roto*, to turn,—a common error, fortified by the application of the word *rote* to more than one instrument, among them the hurdy-gurdy. This last, however humble its status now, was evidently once held in high estimation. It was called, in the early middle ages, the organistrum, and was no doubt used for organizing, *i.e.*, accompanying melody in octaves, fifths, and fourths,—an effect once thought pleasing. The organistrum is common in mediæval sculpture. A cast from a singularly fine example has just been placed in the Kensington Museum. It is held by two of the elders of the Apocalypse, who occupy the place of honour over the doorway of the Church of St. Iago da Compostella, in Spain. In calling attention to the drawings of bowed instruments (about twenty in number) on the walls, Mr. Hullah said a glance at them would show that in the course of development into the violin of to-day, the crwth had undergone metamorphoses many and great. Having regard to the limited time before him, he thought he could not trace those better than by passing those drawings in review. Before doing so, however, he would say a few words about the various names, or modification of the same name, which these instruments had borne. Most of them were connected with, if not directly derived from the Anglo-Saxon word *fithele.* This word was not disused in England till the beginning of the 13th century, when the Norman aversion to the *th* effectually changed it to *fiele*, and eventually *viele*, which by easy transitions became *viol* and *viola*. The modern names *violino*, *violone*, and *violoncello*, are simply Italian diminutives or augmentatives, or both combined, of *viola*. These derivations or connections, however, have not been unquestioned. The Provençal form is *viula*, and the mediæval Latin, *vitula*, easily affiliated to *vitulari*, to leap like a calf—an expression which might figuratively, *very* figuratively, be applied to the motion of a bow. Mr. Hullah then called attention to (1) a viele, from a corbel in the church of St. George de Boscherville, in Normandy, of the 12th century. It resembled the modern violin in having four strings, and being held under the chin; the form, however, was different, and the bridge flat. It was, therefore, an instrument of harmony, a fact confirmed by the player being represented singing. (2). A viele, from a painted window in St. Denis, near Paris, of six strings. (3). A viele in the hands of a monkey, over whose head was written *Neptunus;* from a MS. of the 13th century, at Douay. This was a great improvement on its predecessors, having expanded into a well-formed oval, with a disengaged neck—an important point. (4). Another viele, of like form, from the façade of Amiens Cathedral. It had three strings only, and was resting on the knee of the performer. (5). A *crwth* (called in France a *rote*), also from Amiens, having six strings, and presenting a very early example of sound-holes like the letter S. (6). Another viele, also from Amiens, so placed that its back could be well seen. It was flat, like the so-called Latin guitar. (7). An example of an instrument, the sides of which were *echancrées*, or curved inwards, from a window at Tiges. Mr. Chappell, whose opinions on such points were always worthy of attention, considers that the bent sides were invented "for the purpose of holding the instrument between the knees." Mr. Hullah, demurred to this opinion *in toto*. Examples in ancient sculpture could, no doubt, be found of *echancré* instruments so held, and so could as many or more, in which they rested on the knee of the performer. The "bent sides" originated, he thought, in a very different cause. Though long used as an instrument of harmony, the capabilities of the musical string for melody and expression must have been early ascertained. The strings of the pear-shaped and oval viols he had exhibited were not individually accessible. The bow could not touch one without touching the others. But, by narrowing the sides of the instrument, the outer strings at least could be brought singly within reach of the bow; and so, by elevating the bridge, could the other strings. This great improvement was not universally adopted for a long time. (8) A viele, from a MS. at Brussels, of the 14th century, in its general aspect had more of the violin character than any of those previously described,—four strings, a bridge, a well-defined neck, and a bow of good length and pattern. (9, 10, and 11) Examples of the *geige* and *gigue* of Germany and France: differing little from the viele in shape, but considerably smaller. The gigue was in great favour with the *trouvères*, who seldom mention the harp, viele, and rote (their favourite instruments) without it. Though given up in France and the south, it maintained its favour in Germany till the 16th century, when the German name, *geige* was transferred to the violin proper. (12) A *rebec* (from a picture at Douay), called in the 13th 14th and 15th centuries the *rubebe* or *rubelle*. It had generally two, never more than three strings, tuned, like the violin, a fifth apart. (13) A viele of five strings, slightly *echancré*, and a fretted finger-board. The gentle curve of the bridge pointed to this as an instrument of harmony—the chords being necessarily executed in *arpeggios*. (14) An example of a viele closely approaching the violin, with bold *echancrures*, and four strings, tuned by pegs. The steps from an instrument like this last to the violin, though, of necessity, many, could not have been difficult. Nor were there wanting artists to make them. Of some of these Mr. Hullah said he hoped to speak in his concluding lecture. What remained of the time before him he would rather devote to another musical apparatus, hardly less important than that they had been considering—the key-board. The key-board is obviously one of those contrivances the conception and perfection of which, in all that is essential, must have been simultaneous. It has a basis in nature; its proportions depending entirely on those of the hand, —the average length and strength of the fingers. The key-board for fingers, however, was preceded by one for the whole hand, the keys of which were a yard long and three inches wide. Key-boards, of like importance, are still in use for the *carillons*, so numerous in Belgium. They were applied generally to organs from the 11th to the 14th century, after which they gave place to the key-board, such as we now have it. The latter had probably been invented somewhat earlier, and applied in the first instance to instruments of the class which attained perfection in the harpischord. Mr. Hullah then sketched rapidly the early history of the organ, adducing several proofs of its being of greater antiquity than is commonly supposed. He exhibited two drawings of organs from a bas-relief on an obelisk, erected at Constantinople in the time of Theodosius the Great, the fourth century. Even in Western Europe they were known in the fifth century, and at a somewhat later epoch many were to be found in our own country; at Winchester, for instance, in the 10th century, and at Canterbury in the 12th. Of the infancy of instruments, of the harpischord class, Mr. Hullah said little was known. That they were widely spread in the 14th century is certain; that they were invented considerably earlier is very probable. Instruments of this class are long anterior to the pianoforte. The key-board acted long on the plectrum before it was brought to bear on the hammer, though the use of the hammer, like that of the plectrum, is of immense antiquity. Many names have been successively applied to these instruments. There was the clavicytherium, the clavichord, the clavicembalo, the virginal, the spinet, and the harpsichord —all, with whatever varieties, essentially the same instrument. The last and most perfect of them, the harpsichord, had now given place to the pianoforte. Probably, Mr. Hullah said, few present had ever seen or heard a harpsichord. He hoped next week, when he should meet his audience for the last time, to introduce to them, not a mere effigy, but a very tuneful specimen of this class of instrument, the "silence strings" of which he would find some means of "waking into voice."

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* N.B.—This is found to be very efficacious.

† The object of this is to give the communes an interest in putting the law in force. Other articles have been repealed which relate to small penalties.

Twentieth Ordinary Meeting.

Wednesday, May 1st, 1867; Thomas Twining, Esq., Vice-President of the Society, in the Chair.

The following candidate was proposed for election as a member of the Society:—

Whichelo, George, 14, Burnley-road, Stockwell, S.

The following candidates were balloted for, and duly elected members of the Society:—

Bailey, John, 163, Oldfield-road, Salford, Manchester.
Blacklock, Wm., J.P., Hopefield, Pendleton, Manchester.
Burton, Oliver, Tyldesley, near Manchester.
Henson, Henry H., Rutland-lodge, Watford, and 13, Parliament-street, S.W.
Sandbach, Wm. Robertson, 10, Prince's-gate, Hyde-pk.

And as Honorary Corresponding Member,

Nobile, Signor Commendatore Gaetano, 14, Via Salata ai Ventaglieri, Naples.

Previously to the reading of the paper, the Secretary drew attention to a form of self-acting buffer-break, invented by Mr. C. E. Parker-Rhodes, and intended for use on railways. The principal peculiarity appears to be that the buffer acts upon the break so as to produce a downward pressure on the wheels. The inventor states that his arrangement produces a gradual stoppage of the train, from the engine to the last carriage.

The Paper read was—

ON A MACHINE FOR TYPE-WRITING.

By John Pratt, Esq., of Alabama, U.S.

Custom has so intimately associated the idea of writing with the implement employed in that very ancient art, that most persons, on reading the announcement of to-night's paper, will naturally be in some doubt as to what may be meant by "a machine for writing with type." On the other hand, printing having been for so many ages the sole purpose to which type has been applied, it is not, at first thought, readily conceived that type may be used for any other process. It is only necessary to recur to the true definition of the words writing and printing to reconcile the apparent contradiction. Printing is not, it must be borne in mind, the formation of letters of a particular shape, but of rapidly multiplying copies by means of a press and a bed of movable type—entire words, paragraphs, or pages being impressed at once. Writing, on the other hand, may be largely defined as the art of producing, no matter by what means, the first or original draft of a composition. Viewed in this manner, there seems to be nothing obscure in the title I have chosen for my invention; yet nearly every one to whom I have had occasion to mention it has seemed at first puzzled by the seeming contradiction of the terms "type," and "writing." But the idea of writing with type, though so incongruous, because so new to most persons, is not a sudden growth though a somewhat recent one. Indeed inventions, though children of the brain, are by no means Minerva-like in their birth. They are not manufactured. When questioned closely as to their origin and laid bare of the exaggerated claims of their authors and the enthusiastic statements of biographers, they will almost always return the unsophisticated but profound answer of Topsy to her New England catechist, "I specs I growed." Let me not be misunderstood. I am speaking of inventions, not of the thousand patent mouse traps, nutmeg graters, clothes washers and wringers which cumber patent offices in every part of the world, and perhaps tend more than anything else to worry statesmen and journalists, who should know better, into a peevish hostility to patent laws. No matter to what class belong the various essays to invent a subsitute for the pen, their origin is not so remote as to be doubtful or obscure, and I shall be excused by their very recentness and consequent novelty for briefly noticing them before entering upon a description of my own effort. Before doing so, I must premise that you must not expect me to describe a machine intended for, or proposed to be adopted into general use, as a substitute for the pen. There is none such. As well might you expect to find a lineal ancestor of the sewing machine. This species of development no more proceeds in a right line than the Darwinian, and allow me to say that in tracing its history you will often be encountered by a "missing link." Certainly the first modern printing-press is almost as far removed from the Chinese printing blocks, and Hargreave's jenny from the old-fashioned spinning wheel, as a free and equal "contraband" from his reputed ancestor in the Zoological Gardens. It would be presumptuous in me to claim as great a gap between my poor idea and analogous inventions already made. I do but say that I am the first to invent a writing machine *par excellence*.

The first machine of this kind that I have seen mentioned, is a machine for the blind, invented by M. Foucault, and which was awarded a gold medal in the Paris Exhibition of 1855. The type in this machine was formed on the ends of a number of converging rods, sliding in grooves cut on the surface of a metal plate. These rods were simply pushed to the point of convergence by the finger, where they produced a legible character by means of carbonized paper, the latter being moved as the writing progressed, by a pawl and rack. The Hughes' machine for the blind, which many present have doubtless seen in the Kensington Museum, though not so rapid as Foucault's, is a considerable step in advance on the main idea, inasmuch as the types have a movement in common, and, therefore, cannot clash and clog as with separate converging types, competing, as it were, to reach the same exact point. In the Hughes machine the types pass through the periphery of a circular plate, in a direction parallel to its axis. The plate revolves horizontally on its centre, and the types are successively wheeled to the point where the impression is made, which is done by pressing a lever upon the butt of each type. The whole mechanism is quite primitive, and works slowly, the plate being revolved by the hand, without the intervention of any kind of mechanism.

The next inventions in this general direction are two machines for "writing and making stereotype moulds," both by Americans, and patented in England, the one in March, the other in May of 1866. One of these, invented by Mr. John E. Sweet, is now in the Paris Exposition, where, I believe, it has attracted considerable attention. Though differing much in detail, these machines agree in their salient feature, to wit, the mode of bringing the type to the point of impression. The types are ranged around the periphery of a wheel moved, like the type wheel of the printing telegraph, by clock-work, or by a crank turned by an assistant. In Mr. Sweet's machine the wheel revolves horizontally, and the types are ranged parallel to the axis; in the other invention, they converge towards the centre, like the spokes of a carriage wheel. In both machines, piano keys are employed, each of which stops a particular type at the point of impression; and both in this respect resemble the printing telegraph. The particular manner in which the keys of one of these machines (Mr. Sweet's) perform this office, is very different from that employed in the printing telegraph, and displays much ingenuity.

Several other inventions have been made or attempted for printing and writing, which I need not more than mention. In 1864, a Frenchman, M. Bryois, filed a provisional specification in the British Patent Office for a stenographic machine. It was a crude idea, based on the principle of converging levers. In August, 1866, an invention for "writing and printing" was patented in the United States by a Mr. Peeler, somewhat resembling, I believe, the Hughes' machine for the blind, one lever only being employed for the impression and for controlling and moving the type, instead of a number of keys, and, therefore, like the Hughes' instrument and the one-keyed telegraph, necessarily slow. Finally, on the 21st of last March, a paper was read before the Polytechnic Institution in New York, descriptive of a machine, also for "writing and printing," by a Mr. Hall, which employed piano-keys, and a type-wheel, acting, like the other wheel instruments, on the same general principle as the printing telegraph. I have not described particularly the manner in which, in these various inventions, the paper is moved over the point where the impression is made; nor is it necessary to do so, as the operation itself, of feeding material as it is worked up, is common to many other inventions, and they all adopt a device analagous to that of the sewing machine.

It will be seen, from what I have said, that considerable progress has been made towards the invention of a writing machine. In the first place, the idea has germinated in many different minds, in widely separated parts of the world, that type may be substituted for the pen, in producing the original draft of a composition, as well as in multiplying copies. Again, we find the idea developed that only one set of types must be employed, that they must be brought to the same point in arbitrary succession, a corresponding impression formed there, and, at the same time, the paper which receives the impression move automatically as the work requires. And, in every case, we find carbonized paper employed instead of fluid ink. Nor are these ideas merely theoretical. Most of the machines I have mentioned do very good work, and are a great improvement upon the pen in legibility at least. They all have one defect, which must prevent their employment as substitutes for the pen. They are too slow,—those employing converging type, because of the interference of the types with each other; those employing a type wheel, because of the distance to be traversed by the type. The machines employing piano keys, and constructed on the principle of the printing telegraph, are also objectionable, on account of their great costliness, their cumbrousness, and the necessity of employing extraneous power, or otherwise clockwork, which requires winding up at very frequent intervals. In the case of the telegraph, and of machines for making stereotype moulds, a high speed, though desirable, is not necessary, and the expensiveness of the machine is comparatively unimportant. With a machine designed as a household or ordinary office implement the case is otherwise. Again, machines like those invented for the use of the blind, though sufficiently economical of construction, are even less rapid and less adapted for general use.

I must now approach my own invention, which I do, I assure you, with great diffidence; I know that I have undertaken to do that which many will say is impossible—and say it, perhaps, after I have exhibited the operation of my instrument—to wit, the useful substitution of machinery for manipulation, in an art requiring only less arbitrary and varied movement than that of which its hieroglyphic origin proves it to be the offspring —I mean the art of drawing. Besides this, I am conscious of having as yet fallen far short of the goal at which I aimed at starting, namely, the invention of a machine possessing sufficient rapidity for *verbatim* reporting. Observe, I say I have fallen far short, not failed, for I am confident that a machine may be, and will be, constructed on my principle, sufficiently rapid to record, with the aid of a phonetic alphabet, devoid of word signs, every sound as fast as it is uttered in ordinary conversation. I have not, however, practically developed the idea to that extent; indeed, I have fallen far short of it. The instruments on the table are capable of a rapidity only about twice that of the pen when used in long hand.

Though not so rapid as might be desired, the art of writing with the machine is so simple, that a child will write with it, at its first essay, almost as well as ever after. To acquire rapidity is a work of greater time and labour, although insignificant when compared with that requisite for the mastery of a swift hand with the pen. I have myself been too much occupied with perfecting the invention, and have changed too often the arrangement of the keys, to pronounce definitely how long a time must be occupied in bringing out the full capacity of the machine. I can only say that, after about two weeks' practice, at the rate of two or three hours a day, I can write, with the arrangement of keys I now employ, about as fast as with the pen—say twelve folios an hour. I will explain hereafter my device to still further increase the rapidity of the instrument. For the present, I must be satisfied to claim a rapidity, capable, I think, of demonstration, twice that of the pen, with the legibility of print. Now for my apparatus.

Keeping in view the manner in which the types are arranged and moved to the same point in the inventions I have outlined, and the cause of their low speed, namely, the interference of the types when converging, and the great distance through which they must move when brought to the point of impression by the revolution of a wheel, the problem to be solved by a successful invention of the kind assumes a definite shape. It is so to dispose the types that they may have the smallest possible distance to traverse, in order to arrive at the point of impression. For this purpose it is obvious that it is most advantageous to arrange them in a number of series in the form of a square, instead of in a single line, as in the wheel machines. Thus disposed, the distance to be traversed by the most distant type, is only the square root of what is necessary in the other case. Thus, taking the dimensions of a single type as the unit of measure, if 36 characters extend $\frac{36}{16}$ of an inch when ranged in one series, they will extend only one-sixth of that distance, or three-eighths of an inch, when placed in the form of a square. But in order that the type may be successively brought to the same point, the plate must have a great variety of movement, both as to direction and distance, and this variety must be differentiated, so to speak, out of one simple vertical movement of a number of levers. The solution of this geometrical problem is the main feature of my invention, though I may as well observe, here, that my methods of moving the paper, and making the impression are also new.

The whole mechanism is contained in a small case, composed of two rectangular frames, mounted the one on the other, giving the side elevation an L shape. A number of levers, furnished at one end with keys, extend from front to back the interior length of the case. Extending across, and a short distance above these key levers, near the back of the case, are two oscillating plates or rocking frames. Between the fulcra of the key levers and the oscillating plates just mentioned is a third oscillating plate, also placed above and across the key levers. These three oscillating plates are moved simultaneously by each key, and perform simultaneously the three different operations already mentioned as requisite in a machine for writing with type, namely, bringing the types in arbitrary succession to one point, forming a corresponding impression there, and moving the paper.

First, the manner in which the types are brought to the same point. These are disposed in slight converging lines on the face of a thin metal plate, which, for economy, is electrotyped in the ordinary manner. This plate is worked by the simultaneous and combined action of the two oscillating plates at the back of the case. If you will bear in mind the connexion between a line and a single force on the one hand, and area and compound force on the other, you will more readily conceive the *rationale* of this part of the mechanism. With one of these oscillating plates, the type plate is connected by a vertical lever, to the upper end of which it is fixed, being supported at its back by a metal bar. With the other oscillating plate, it is connected by a bell crank lever and two wire links, one of which extends vertically from the horizontal arm of the bell crank to the oscillating plate; the other passes horizontally from the vertical arm of the bell crank to the lever to which the type plate is attached. If only one of the oscillating plates be moved, the type plate moves in only a vertical or horizontal direction, according to the one employed. When both are moved together, the resultant motion of the plate is diagonal. By varying the relative degree of the two movements, the direction of the type plate is equally varied, and any given type may be moved to any desired point. In other words, by varying the relative amount of movement of the oscillating plates, the vertical or horizontal movement of the type plate may be made to preponderate, more or less, in an indefinite degree. This variation is effected by adjusting screws, which pass vertically through the key levers, and impinge against the under surface of the oscillating plates. Through these screws, the key levers, though having the same relative movement, communicate each a different degree of movement to the plates, and this difference in extent becomes a difference in direction when the motion is transmitted to the type plate. A machine, when finished, is adjusted in a manner very analogous to the tuning of a pianoforte, with the important difference that performers may tune their own instruments in a few minutes, and may also consult their own taste in the arrangement of keys. The motion of the type plate is checked at the proper moment, to receive the stroke of the type hammer, by springs, which oppose a moderate and nearly uniform resistance to the movement of the oscillating plates.

The Society will perceive that I have presented two models for their consideration. These instruments, although employing a different number of keys for the same number of types, are identical in principle. In one, the oscillating plates extend across the whole number of key levers, so that every lever may operate both plates, and thereby exert a complete control over its respective type; in the other, they extend only half the lateral space of the levers, each lever operating only one of the plates, and therefore producing only one movement of the type-plate, so that it becomes necessary to depress two keys at once in order to bring any given type to the impression point. The variety of movement requisite to control the whole number of characters is procured by employing the keys permutatingly, each key being employed in conjunction with a number of other keys. This arrangement, although open to the objection of requiring the simultaneous employment of two keys—an objection which, at first, caused me to reject the idea altogether—has the advantage of requiring a much smaller number of keys, for, since each key controls a row of types instead of a single type, the number of keys need only equal the number of horizontal and vertical rows; in other words, twice the square root of the number of types. For instance, if there be 64 types arranged in eight horizontal and eight vertical rows, the number of keys need be only 16.

For convenience, I have arranged the keys which give the plate a vertical movement on the right-hand side, and those which move it horizontally on the left-hand side of the machine, leaving some space between them. This, however, has nothing to do with the principle of the invention, as the other instrument also may, without removing or adding a lever, be so adjusted as to require the simultaneous depression of two keys, in which case all the keys beyond twice the square root of the number of characters become supernumerary. There was, however, a considerable practical difficulty to be overcome in adapting this arrangement. This was the deflection of the plate from a right line in its vertical movement, caused by the arc described by the horizontal link connecting the bell crank lever with the type plate lever. Thus, if I keep depressed the key which brings the first left-hand series of types under the hammer point, and meanwhile depress a key which moves the plate downward, the arc described by the link will cause the character at the upper end of the series to be deflected to the left about one hundredth part of an inch, an error of great consequence in so nice an operation as writing at all accurately with type. This might have been remedied by having the characters engraved on the plate in lines, having a counter curve of a radius equal to the link, had it not been for the necessity that they should converge towards the hinge of the type-plate lever. I finally overcame the difficulty by hinging the bell-crank lever to a second lever, to which I give a movement to the right, by means of a link attached to a lever operated by one of the oscillating plates. The arc described by the last-named lever neutralises the arc of the bell-crank link. Engineers will doubtless perceive the analogy of this device to the parallel motion of Watt. In this parallel motion the problem is complicated by the circumstance that the link whose arc is to be compensated is hinged to a shifting centre, namely, the upper arm of the bell-crank lever.

I hope I have said enough to convey a sufficiently accurate idea of the manner in which the first operation of my machine is performed. I have been somewhat full in the description of this part of my invention, because I am not aware of any analogous employment of compound motion, in any branch of mechanics, to produce indefinite variety of direction.

In describing the second operation of my machine—namely, the impression—I shall be very brief. It is effected by a hammer, having a face equal in extent to a single type, which strikes against the several types the instant they are brought within its range, a sheet of carbonized paper held in contact with a sheet of writing paper. Transparent transfer paper may be also employed, as well to enable the operator to see the progress of the writing, as to preserve a copy. The hammer is operated by an oscillating plate, with which it is connected by a small rod hinged to its butt. This rod has at its lower end a catch, which engages an arm projecting from the oscillating plate, and having an eccentric movement, which causes it to act in a manner somewhat analogous to the hopper of a piano. The depression of a key lowers this eccentric arm, and retracts the rod and hammer. Just as the key has been carried through its full movement, and the corresponding type brought to the proper position, the catch is pushed off the eccentric, and the hammer impelled against the type by a spring. The exact moment when the hammer is released from the catch—a matter of great nicety—is determined by a screw adjustment. When the key is released, the arm of the oscillating plate again engages the catch, and the hammer is ready for a new stroke. It is therefore necessary, with this arrangement, to release one key before striking the next; and it is this necessity that limits the rapidity of the instrument, which otherwise might strike off printed characters as fast as the piano can yield consecutive notes.

I have overcome this difficulty by applying the device for operating the hammer to each one of the key levers, instead of to the oscillating plate, and thus there are always a number of levers ready for action. The principle and efficiency of this device, which has not yet been applied to the machine, I have demonstrated by a partial model employing only the mechanism requisite for operating the hammer. This modification, however, is not adopted as a mode of removing a defect, but of adding to rapidity, which will be found already sufficient for the requirements of most operators.

Now for the feed of the paper. A square open frame, which for distinction may be termed the page frame, slides in vertical grooves formed in the upright part of the case, in the plane of the type plate. Within this, a second frame, which may be termed the line frame, moves horizontally from right to left. The movement of the latter makes the lines, and of the former the pages, of writing. The movement of the line frame is given by a square steel rod revolving in vertical bearings, and moved by a spring, which is wound up at the completion of each line by striking a key. The motion of the rod is communicated to the frame by a small pulley, turning with the rod upon which it slides with the page frame during the progress of the writing. Its movement is regulated by an escapement wheel and pallets, the latter being connected by a link with an arm projecting vertically from the oscillating plate which operates the hammer. The same key-stroke which moves the hammer produces an oscillation of the pallets, and allows the paper to move the distance of a letter and space. The oscillation of the pallets may be effected by a partial movement of the keys, so that the paper can be moved without moving the hammer, when it is required to make a space instead of a letter. By this means I get rid of the space key used by all previous machines of this or an analogous class, every key serving as a space key. The carbonized and writing paper are held in a clamp resting loosely in an angular projection of the line frame, whence they are easily and quickly removed for a fresh sheet of paper.

It only remains to show how the paper is brought back to its starting point for a new line. To reverse the movement the escapement wheel must first be freed from the pallets, which for this purpose are mounted on a lever, connected by a link with one of the key levers, and the depression of which effects the disengagement. This done, a second key must be struck, which operates a link, bell-crank lever, and toothed sector, thus reversing the movement of the frame and bringing it to its starting point.

To make the proper interval between the lines, the page frame is provided with a rack, moved by a pawl of peculiar form and adjustment, which leaves the teeth always free, so that the frame may, at any stage of the writing, be moved in any direction. The pawl is operated by aid of one of the key levers with which it is connected by a vertical link rod. A page being completed, a new sheet of paper is placed in the clamp, and the page-frame is pushed back to the bottom of the grooves.

To judge from the length of time it has taken to give a rather general idea of my invention, one might be led to suspect that it is a very complex affair. But I think it will generally be found in machinery that the most complex idea, if fully matured and thoroughly developed, is the simplest and most economical to embody in the actual machine. At least, I know this to be the history of my own invention. My first effort was based on the simple and comparatively obvious idea of converging rods; and yet, if you could compare a model which is still, I presume, in the lumber-room of a pianoforte manufactory in Glasgow, with those on the table, you would perceive a great improvement as regards simplicity and economy of construction. I may as well mention that these possess another important quality lacking in my first machine, namely, the capacity of writing—a feat the other, though otherwise unexceptionable, wholly refused to perform.

But I think a glance at the construction of these instruments is sufficient to convince those who have a knowledge of machinery of their simplicity and economy. The case is small, compact, and being subject to no strain, must last indefinitely. The key levers, which are of wood, are strung on a polished steel wire, and work on the cloth centres, so serviceable in the piano, and so cheaply renewed when worn. The oscillating plates and hammers are also of wood, working in similar bearings. The other levers are hinged on vellum joints which cost little and last almost a lifetime, and, finally, the links immediately controlling the type plate work in india rubber joints which have no friction, no wear whatever, and can never become loose. The only parts of the machine which must be of metal are the type plate, the hammer head, the escapement wheel and rod, and a few pieces of steel and brass wire. The type, not being subject to any corrosive action, and being protected by the leather which covers the face of the hammer, will last almost indefinitely, and when worn out—of which I, in my brief experience of the matter, have seen no indications—may be replaced for a penny. Again, owing to that peculiar feature of the machine,—the screw adjustment of the type—type plates of different sizes, styles, and having various complements of type, may be employed in the same machine. To recur to the question of simplicity and economy of construction, which in an invention of this kind is of special importance in estimating its utility, I will merely add that, with sufficient capital to manufacture on a large scale, it may be easily sold at a very large profit for three guineas, a sum not much greater than the cost of the paper that would be saved by a year's employment of the machine in an office having much correspondence, and but little more than the copying press now used in all counting houses, and which would be rendered useless by the adoption of this writing machine.

A larger and more interesting question than the question of economy of manufacture is behind. Is there a want, and does the invention supply it? If the pen is everything that is required in the combined qualities of legibility, accuracy, rapidity, and ease of mastery, then this invention is useless. Again, if this writing machine is not more rapid, legible, accurate, or easier to learn than the pen, it has not supplied the want, and some inventor possessed of greater ingenuity, more patience, and fortitude under discouragement, or more abundant means and leisure than I, must and will come to the rescue; for civilized man knows no real want which civilized man cannot supply.

It is almost needless to show the existence of a want of a brain-tool better than the pen. Its inaccuracy quashes indictments, increases and breeds litigation, and hinders and delays the law-suits it engenders. Its obscurity and illegibility obstruct the author in criticising his composition, the publisher in estimating its worth, and the printer whose eyes are worn out in trying to decipher it. In short, it increases the cost of books, and diminishes their literary value. In private and public correspondence this defect of the pen is felt as almost a nuisance. I say felt, because as long as it is not clearly seen that an implement may be improved, or wholly or partially supplanted, its short-comings are very naturally attributed to want of skill in the operator.

The next question is, what a machine of this class must be capable of accomplishing in order to be useful, other things being equal. This is a question that will receive various answers from different individuals, but perhaps there are not many who will pronounce useless a cheap and durable machine, having even the rapidity of the pen, the legibility of print, so easily understood, that a child that cannot write with the pen will write as well with the machine as after a lifetime of practice, and so easy to master that, after a few weeks' leisurely practice, one may write as fast as with the pen. At this point, then, I shall stop. It may, it is true, be demonstrated that the machine possesses a far higher capacity for speed, for by striking the keys at random more than twice as many letters may be formed in regular succession as with the pen, and by adopting the modification of hammer stroke referred to in the description of the machine, there is no limit to rapidity, except what the nerves and muscles of the operator impose. But I repeat, that I shall be content to bring the invention up to the criterion first named, and which my own very brief use of the machine demonstrates can be done.

After reading the paper, Mr. Pratt explained in detail the various parts of his machine, and exemplified its practical working by copying a paragraph from a newspaper that had been handed to him.

DISCUSSION.

Mr. Campin said he was afraid he did not quite understand the details of this invention, which, however, appeared to be a very ingenious one, and likely to have its uses. There were one or two points, independent of the nature of the machinery, which he would be glad to be enlightened upon. In the first place, he would ask whether this machine would produce a number of copies of that which was written or only one?

Mr. Pratt replied it would give three or four copies at once if required.

Mr. Campin further inquired whether there were the means of correcting inaccuracies as was done in ordinary writing, by striking the pen through the word and re-writing it, or by interlineation. One point which struck him was that, if this invention were brought into use, they would not have the advantage which they now had of identifying a person's letter by his handwriting, because all letters would be in the same printed type.

Mr. Galloway asked whether this was proposed as a new system of printing generally?

Mr. Pratt, in reply to Mr. Cowper, stated that corrections and interlineations could be made as readily by the machine as with a pen. If a wrong letter or word was written, it could be erased, and another put in its place. The paper could be run back to the same point, and the interlineation could be readily made; there was no difficulty whatever about that. In answer to the last speaker, he would state that this invention had nothing at all to do with printing. It was simply a writing machine, which would work more rapidly than the pen, and the result would be more legible. As a matter of course, this machine did not furnish the means of authenticating documents. The machine was not intended entirely to supplant the use of the pen, any more than the sewing machine would ever supplant the use of the needle. There were some things which the sewing machine could not do, and it was the same with this machine. It could certainly not be employed in book-keeping and the making up of ledgers. It was a machine the use of which was so readily acquired that it might be superadded to the accomplishment of writing with the pen. It was brought forward as a good substitute for the pen for writing letters or manuscripts for the press, and he thought for law-stationers it would be valuable, because it was so much more legible and so much more easily acquired than writing, and one person could write with it as well as another, when the operation was confined to the mere copying of documents.

Mr. Curley, in reference to the question of the multiplication of copies, said it was often the case that from ten to twenty copies of law papers were required, and it was necessary for the type to be composed for that purpose. He wished to ask whether it would not be practicable, in this machine, to have several frames arranged so that one set of keys could move the whole, and as many copies as were required struck off at one operation?

Mr. Pratt replied that the machine, as at present constructed, could furnish three or four copies of a document, in which case very thin paper must be used. In cases in which twenty or thirty copies were required, he thought they could be produced more economically by transferring an impression to the lithographic stone. A paper written by the machine with the thick oily ink he used, could be transferred direct to the stone, and any number of copies could be printed from it.

Mr. Campin inquired whether ordinary writing paper could be used, or whether it was necessary to use the paper employed for manifold writing?

Mr. Pratt replied that three or four copies could be produced on ordinary note paper, provided it was not of extra thickness. Specially prepared paper was not required. In reference to the specimen of writing which had been handed to the meeting, Mr. Pratt said any mistakes that occurred were his own fault and not that of the machine.

Mr. Galloway thought that the time required for the operation was as great as, or greater by this process than by the ordinary method of writing. With respect to its application to letter writing, they knew that in mercantile transactions the handwriting formed an essential element, therefore he felt the invention would have much to contend with on that ground.

The Chairman said it now devolved upon him to ask those present to pass a vote of thanks to Mr. Pratt for his able paper, describing a most interesting, and, as he hoped it would prove, a most valuable and useful invention. He had no doubt the meeting would cordially join in that vote.

Mr. W. H. Bonnewell said he hoped it would not go forth that in passing that vote of thanks to the author of the paper, the meeting endorsed the feasibility of the invention which had been brought before them this evening. He would be sorry to throw any discouragement upon an ingenious invention; but having had some experience in these matters, he felt himself compelled to give an adverse verdict upon it. He recollected two or three years ago, there was an ingenious plan brought before this Society for boat-building by machinery, and a company was formed for carrying it out, but the whole thing was a signal failure, though it went forth to the world with a kind of impress from this Society as to its merits, in consequence of a vote of thanks having been passed to the reader of the paper. He would therefore say, while he quite concurred in a vote of thanks being given for the great ingenuity displayed in the construction of the machine, at the same time if that vote was to be regarded as a verdict in favour of it, he should feel disposed to dissent.

The Chairman said he hoped it was quite understood that this Society did not pledge itself in any way to the merits of anything which was brought before it. A machine of an ingenious character had been ably described, and with regard to the passing of a vote of thanks to the gentleman who had done so he was sure there could be but one opinion.

The vote of thanks was then unanimously passed.

Mr. Pratt, in acknowledging the compliment paid him, said it would be an ungracious act on his part to attempt to obtain from this meeting any special recognition of the good qualities of the machine he had brought before their notice. His object in reading the paper was merely to describe the machine, but the brief explanation he had thus been able to give would not be sufficient to establish its merit or demerit. Experience alone could do this. He had merely brought it forward to let it be known that there was such a machine in existence, and he left it in the hands of the public for what it was worth. He begged to thank the meeting for their kind acknowledgment of his paper.

Fine Arts.

PARIS ANNUAL EXHIBITION OF WORKS OF LIVING ARTISTS.

The *Salon* opened, according to announcement, on the 15th ult., and now competes, to a certain extent with the Universal Exhibition. The number of paintings collected in the Champs Elysées is 1,581, or more than four hundred less than last year. It is said that the admission jury was excessively severe, and undoubtedly the number of very bad pictures is not large this year; unfortunately, the absence of works of striking merit is equally beyond question. Few of the leading artists exhibit, and those who do have generally sent small works. The great room, or *salle d'honneur*, is relatively poorer than the rest, for the two chief places are occupied by canvases which are more remarkable for size than for artistic value. One of these is the "Tapis

Vert"—the gambling-table of Baden—by Gustave Doré, which exhibits fertility of conception, daring colouring, humour, an eye for character, but sadly wants composition, harmony, and elevation in the treatment; the other is an immense decorative composition, by M. Puvis de Chavannes, called "Le Sommeil."

The most remarkable pictures in this principal room are—"The Abandonnée," by M. Schreyer, a young artist who obtained medals in 1864 and 1865. The subject is not highly attractive; a cart on a bleak moor, the carman and one horse dead, struck down, perhaps, by lightning, and another horse imprisoned in his harness, and apparently nearly dying of hunger; the last-named animal being painted with rare talent. "Feuilles d'Automne," by Hébert—an exquisitely painted forest lane, carpeted with yellow leaves, along which passes a melancholy female figure in black; the same artist has in another room a fine characteristic figure of a gipsy woman. "The Promenade," by Heilbuth; a cardinal is walking on a terrace, and gives his hand to a child to kiss, two footmen looking on with most comic gravity; the picture forms a companion to the meeting of two cardinals exhibited a short time since by the same artist. "Byblis changed into a stream," from Ovid's metamorphoses, is a good made study, by Henner, who has received all the medals. "Pius IX. in adoration before the statue of Saint Peter," with a priest and peasants prostrate on the pavement, by Jules Joseph Lefebvre, a young artist who won the prize of Rome in 1861. "An Episode of Saint Bartholomew," by Isabey, who has exhibited but little of late, a small picture of the interior of a church desecrated by frightful massacre, painted with admirable force and effect. Two charming flower pieces, by a young artist named Maisiat. "The Prince Imperial entertaining his young fellow soldiers in the Bois de Boulogne," a cabinet picture by Yvon, the well-known painter of battle-pieces. "His Highness on a Journey," by the clever artist Knaus, of Dusseldorf; a German officer, whose face is wrinkled with care, is followed through a village by two other officers, one fat and full of mischief, the other a young military dandy of the first water; the schoolmaster, the notabilities of the place, and a crowd of children, bowing, smirking, and staring in the most amusing manner, while a little dog, in no way awed, barks furiously at his excellency. The attitudes and faces are admirable, full of humour and variety, exquisitely comic, but all kept fairly within the legitimate bounds of art. M. Cabanel has only two portraits, one of the Procureur-General, the other of a lady, but they are certainly not equal to other works by the same hand. "The return from the Crimea," by Protais, a party of soldiers on the deck of a ship, many of them wounded, hail their native land with intense and varied expressions of interest; the picture is interesting, but the artist has produced better works. "Visit of Josephine de Beauharnais to her husband, confined in the Luxembourg," a pleasing picture by Viger. A large and well-painted picture of a slave market, by Victor Giraud, a young artist, holding forth good promise; the prosaic air of the richly-dressed purchaser, and the varied attitudes and expressions of the slaves, are expressed with great effect. An admirable view of one of the famous rooms in the museum in the Hôtel Cluny, by an older painter of the same name—Charles Giraud. A fine portrait of the Archbishop of Paris, by Lehmann; "Queen Hortense dispensing charity at the fine old Chateau of Ecouen," a pleasing composition, by Eugène Lejeune; a somewhat formal representation of the arrival of the remains of Napoleon, by a well-known artist, Felix Philippoteaux; "Job and his Consolers," by Lecomte Dunouy, a large composition of some merit; a pretty pastoral scene, three peasant girls returning from the fields, one of them with an arm thrown over the shoulders of her two companions, and a child with a poppy in its hand, by an able artist,—Jules Breton; a somewhat meretricious picture of Napoleon when First Consul at the marriage of Junot, by Jules Masse, a pupil of Delaroche. One of Meissonnier's gems, a party at the door of a roadside house, the chief figure, a cavalier, admirably posed; the work has not so much interest as many others by the same artist, but the treatment and costume are out of his general style, and therefore present a new phase of his ability, and the handling is exquisitely delicate. Lastly, four landscapes, two by Rousseau,* in his usual style, scarcely supporting his deserved reputation; and two by our countryman, MacCallum, which attract great attention; one scene is laid in Windsor Forest, and challenges criticism from the strange, flat, yellow tone which pervades the whole picture; but the other is, unquestionably, a magnificent work; it represents a clump of oaks on a rising knoll in the forest of Sherwood; and the rendering of the trees, the perspective, and the atmospheric effect, are most remarkable; the picture is very large, and original in treatment, and is certainly one of the gems of the *salon*.

The following are a few notes made during a first visit in the other rooms of the exhibition:—A pretty "Psyché," by an artist of standing, Amauray Duval; a charming young nude figure, entitled, "Idylle," by a rising artist, James Bertrand; a pretty quaint composition, "The House of the Painter at Pompeii," the artist engaged on a mural decoration, by Biennourry; a charming picture, called "Ribéra painting at the door of the Ara Cœli at Rome," a little child in bright-coloured apron, standing in the centre, against the old gray wall, and several other figures; and a curious, but powerfully-painted female figure, called "Gaby," by the same artist; a picture, called "Le Mamillare," representing the toilet of an antique dame, treated somewhat after the manner of Gérome, by G. R. Boulanger; "The Sixth day of Creation," a most curious attempt to represent an unapproachable subject, by Brion; an exquisite study of a "Young Girl of Rhodes;" and a pretty little composition, "A Jewish School at Tangier," by Madame Henriette Browne. "La Lectrice," by Compte-Calix; a beautiful girl in mourning (a governess, probably), is reading to a family; two young men watch her with evident devotion, while the mother of the family regards her with attentive eye; the composition is rather stiff and mechanical, but the poor reader's nervous face is painted with great skill. The same artist has another picture, called "The Rural Postman;" the jolly facteur seated at a well-covered table in the kitchen, while the ladies chat with him and the servants laugh in chorus; an excellent bit of comic painting. M. Comte, a well-known artist, contributes a picture of Henry III. during the assassination of the Duke of Guise; the cowardly king listens with his ear close to the door, his face pallid with terror, while two flaring candles throw a lurid glare over the whole; a powerful but very odd composition. M. Gerôme only exhibits two small pictures, "The Slave Market" and "The Dealer in Wearing Apparel, at Cairo," both most carefully-painted and attractive pictures, but not to be ranked with his best works. M. Eugène Giraud presents us with another daring glimpse of "The Opera Ball," treating a hacknied subject with considerable originality, but scarcely succeeding in telling any tale. M. Hamman pays an excellent tribute to Meyerbeer, who is represented as if in the act of composition, while the creations of his art flit like genii around the musician. M. Landelle has a small but admirably-painted work, "Jewish Talebs of Morocco," transcribing the laws of Moses for the synagogues; two figures full of study and character. M. Müller has produced a good picture of Galileo in his captivity, visited by the nobles of Sienna. M. William Wyld, a charming work, entitled "Souvenir of the Bay of Naples."

Such are a few of the more salient points in the Paris Salon of the present year, which has so formidable a rival in that of the Champ de Mars; there is little doubt that the latter has robbed the former of many an ornament, but the salon presents an admirable collection of average French art at the present moment, and therefore deserves careful examination. There is certainly less originality, and at the same time less eccentricity, to be noted than usual, but there is a positive advance in drawing, manipulation, and colouring.

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* Whose name, like that of Meissonnier, does not appear in the catalogue.

Art in the Paris Universal Exhibition.—The French sculpture may scarcely obtain the attention its high excellence deserves. It does not gain effect by concentration on any one point, but is scattered about as a means of decoration. Yet, collectively, there has seldom been a finer or more instructive display, even in an International Exhibition. These works are worthy of special study on several grounds. First, because no national school is better acquainted with the human figure than the French, or shows more mastery in drawing or modelling. And secondly, because this knowledge of the figure extends itself from the sphere of sculpture proper into the decorative arts generally. Thus, a chief reason why French bronzes are the best in the world is, that French sculpture in marble is decisive in form, sharp in the articulation of a joint, firm in the definition of a muscle. In short, our English artizans will do well to determine, on the evidence furnished by the French courts generally, how far those teachers are right who insist on the study of the figure as a preliminary and groundwork to decorative design. For this end it will be wise to pass from French sculpture to French manufactures, to mark how figures first modelled in the clay have been reproduced in bronze, zinc, iron, or the precious metals; to observe how knowledge of anatomy and a decisive and firm hand are turned to good account in the carving of wood and in the design and decoration of furniture. The best means, perhaps, of arriving at an intelligent understanding of the complex school of French sculpture is through a distinctive classification. It will be well, for example, to examine the 215 figures which constitute the collection under the following heads:—Schools antique, schools romantic, schools naturalistic, and sculpture portraiture. The collection is so far thorough that it will be possible, at the cost of some labour, to determine the strength or the deficiency of modern French sculpture in each of these departments. To enumerate names or mention individual works which are almost wholly unknown in this country would answer no good end. Perhaps it will be more to the purpose to point out what characteristics the student should look for, and what the excellencies or defects he is likely to find. In the revival of the antique it may be said that the French have properly seized on the old severity, and that their decision and firmness in modelling give them in this line a specialty. In their life-size bronzes, in which they naturally recur to Pompeian precedents, they also have a specialty. Some such figures are, perhaps, pushed needlessly into archaicism. Cavelier's "Neophyte" may be quoted as a very perfect example of the adaptation of the antique to modern art. Coming to schools of romance it will possibly be found that the French are surpassed both by the Italians and the English. Baily's "Eve at the Fountain," were it in Paris, would show a purity of sentiment foreign to a French work. Sentiment, it will be seen, the French push rather far; Moreau's "Studiosa" is, however, a figure of tenderness and beauty. It will be discovered that the French are strong in naturalism after its varied forms. "Chactas at the tomb of Atala," by Gruyère, is a novel and striking example of naturalistic sculpture. Capellaro models a "Labourer," suggested by Virgil's "Georgics." Then, Cambos gives, in "La Cigale," an elaborate study of naturalistic drapery. And here it may be recommended that the various styles or treatments of drapery should be noted—the classic, the naturalistic, and the generalized romantic. The exhibition contains fairly good examples of all. The German school of drapery has been known as singularly learned; the paucity of German sculpture is to be lamented. French naturalism is sometimes pushed into the picturesque or grotesque, as in the bronze statue of a "Negro," by Lequesne. Works wherein the whites of the eyes are actually represented by light coloured stone or enamel have been found at Pompeii. Such figures are, generally, not Greek, but late Roman; and the art is poor, not to say corrupt. In busts and portrait-statues the French show their accustomed aptitude. The sculpture, indeed, which is true in naturalism seldom fails in portraiture. Three works in this department specially deserve notice, both for excellence and as distinctive in treatment. Guillaume's "Napoleon I." is essentially statuesque and monumental; severe and stately; Carpeaux's "Prince Imperial," with a dog, deservedly one of the most popular figures in the exhibition, is picturesque; and Thomas's "Mdlle. Mars" is perfect as a statue of costume. Finally, it may be worthy of remark that the mediævalism of sculpture, that the styles which have risen responsive to Gothic revivals, find little place in Paris. The well-known statue of "St. Louis," by Montagny, given by the Emperor to the church of St. Louis d'Antin, partakes of a severity and dignity befitting architectonic sculpture. Also Dubois' striking figures show exceptionally the influence of the middle ages. "Narcissus" is allied to Michael Angelo, "The Infant St. John" to Raphael, and "The Florentine Singer of the 15th century" to Donatello.

Colonies.

Resources of New South Wales.—The Sydney catalogue of the articles sent to the Paris Exhibition is in itself an exposition of the resources of the country. The articles comprise wool, preserved meats, horns, hides, tallow, wheat, barley, oats, tobacco, cotton, wine, flax, silk, sugar, coal, iron, gold, and copper. Wool was the first of the industries of New South Wales, and is still the greatest. Ambitious as the colony is of getting out of the pastoral stage, and becoming a country of manufactures as well a country of shepherds, the limit of pastoral development has not yet been reached. A considerable portion of the interior is still lying waste, and in a few years there will be millions more sheep than now. In the settled districts the land is being enclosed, and it is proved that fenced land carries more sheep than unfenced land. It is impossible to name the quantity of sheep the colony is capable of nourishing. In the quality of the wool produced there is much need for improvement. Those who have paid attention to breeding get more profit from the wool of one sheep than others do from two. Increased care is now being given to breeding for wool. Of late years attention has been paid rather to quantity than quality, and there has been, in consequence, some deterioration in the fineness of the fleece. But the tide is now turning, and an increased number of sheep farmers are paying attention to the quality of their flocks. It is expected, therefore, that an annual improvement will henceforth take place in both quality and quantity of the wool exported.

Railway Statistics in South Australia.—There are now 113¾ miles of railway at work in the colony. The passenger receipts in 1866 were £38,363, and for goods, £75,739; together, £114,102, showing a deficiency, as compared with the receipts of 1865, which amounted to £133,313; total number of passengers in 1866, 358,362. There are 1,582 miles of telegraph lines, and 58 stations in operation. Receipts in 1866, £17,649 for 121,153 messages, against in 1865, £17,041 for 112,344.

Queensland.—The demand for labour in Queensland has now so nearly equalled the supply that Government have resolved to discontinue the various relief camps that have for months past been at work in the vicinity of Brisbane and Ipswich. Manganese is now reckoned among the products of Queensland; two tons have been shipped at Gladstone *en route* for England. The cultivation of cotton is rapidly extending in Queensland. Four years ago the growth of cotton in this colony was considered an interesting experiment, but few persons expected any practical result would follow. In 1862 14,344 pounds of cotton were exported, valued at £1,423, and in 1865 the quantity had augmented to 612 bales, containing 183,680 lbs. of clean cotton, and during the past year a much larger area of ground was put under cultivation, and the total yield is estimated at about 3,000 bales.

Publications Issued.

A History of the Machine-wrought Hosiery and Lace Manufactures. By William Felkin, F.L.S., F.S.S. (*Longmans*).—The author has done well in putting on record the knowledge which it has taken a lifetime to acquire, a knowledge, too, which scarcely any other man, probably no other man living, possesses. Mr. Felkin has taken advantage of the peculiar opportunities for the acquisition of this knowledge which his long residence in Nottingham has afforded him, and to his industry and capacity for the task the public are indebted for this history of a great staple trade of the country. Mr. Felkin has long been known in connection with the trade of Nottingham; and his efforts in aid of the Exhibition of 1851 are well remembered by all who were engaged in that grand industrial display. He entered the stocking-making business in 1808, and the lace trade in 1819. In each he was called to take an active part, and since 1828 he has occupied a public position in many transactions connected with both until 1864. The knowledge of persons and events thus necessarily acquired, he has often been urged to embody in such a work as the present. He states in his preface that "having been freed from other pressing duties, he has devoted the whole of the seventy-second year of his life to this effort." How laborious has been the task may be judged, when it is borne in mind that it has thrown upon him the giving an account of inventions and patents, which, in numbers and prolixity of specifications, are probably unexampled in any other manufacture, and all of which have had to be investigated. The short notices of these in the patent list issued from the office fills a volume of 1,070 pp. Mr. Felkin's work traces the progress of the machine-wrought hosiery and lace trade from Wm. Lee downwards through Strutt, Heathcote, and a host of others, both foreign and native, who have from time to time added invention after invention, until the perfection to which the manufacture has arrived is little short of miraculous. There is one curious feature in the history of these inventions, viz., that, with the exception of Lee and Strutt, every one of the many English inventors was a working handicraftsman. As regards machine-made lace, it is stated that such is the excellence at which it has now arrived, that certain descriptions defy the keenest observer to distinguish it from the hand-made article. The work is comprised in a goodly octavo volume of 560 pages, and is largely illustrated with wood engravings and lace patterns. It not only enters into the history of the various inventions connected with the manufacture, but treats at length of the social and economic conditions affecting the trade at home and abroad, and furnishes copious statistics of its progress and present position.

Notes.

Preservation of Milk.—Gay-Lussac has proved that milk kept from the air is preserved for a long time perfectly good. Profiting from this experience, M. Mabrun warms milk in a moderate temperature in a tin vessel, furnished with a tube of lead, to expel the air; then the tube is compressed, and the orifice is closed with solder. When the milk is used at the end of several months, it will be found desirable to stir up with it the cream which is formed on the upper part of the liquid. M. Mabrun, having laid this process before the Academy of Sciences for their examination, the committee report that milk thus preserved after six months still possesses all the properties of fresh milk. A prize of 1,500 francs has been awarded to M. Mabrun.

Nicotine in Tobacco.—A Belgian chemist, M. Melsens, who has made numerous communications to the Academy of Sciences, has found that the proportion of nicotine contained in different species of tobacco varies much according to where it is produced. The tobacco grown in France, especially that from the department of Lot, contains about 7·96, or near 8 per cent. of nicotine, whilst from Havannah tobacco only 2 per cent. is found. M. Melsens proposes to smokers, to preserve them from the baneful effects of this alkaloid, to put in the barrel of their pipe or in the cigar-holder a little plug of cotton, impregnated with a mixture of tannic and citric acids. The smoke passing through cotton leaves the nicotine, which combines with the two acids to form tannate and citrate.

Paris Exhibition.—Visits of Teachers.—The following minute has been recently passed by the Committee of Council on Education:—1. In accordance with the practice of the Science and Art Department at the International Exhibitions at Paris in 1855 and in London in 1862, my lords think it desirable to offer encouragement to the masters teaching in schools of science and art to visit the present International Exhibition at Paris, with the view of studying those objects which may be likely to benefit the instruction given in such schools. 2. Their lordships therefore announce to the certificated masters now engaged in giving instruction in schools of science and art connected with the department, that they will pay to each such master or mistress visiting the Paris Exhibition, the sum of five pounds in aid of their expenses, and to each an additional sum of two pounds for any report, or any useful suggestions which any such teacher may make (in respect to his or her duties or teaching) derived from the study of the Exhibition, such report having first been published in any journal, local or otherwise, and afterwards approved by their lordships. 3. And, further, to each of the three best of such reports referring to instruction in science, and to each of the three best reports referring to art, my lords will give respectively the following prizes in addition to the sum above named, namely,—for Science, for the best report, twenty pounds; for the second best report, fifteen pounds; and for the third best report, ten pounds; and the same sums respectively to the three best reports for Art.

MEETINGS FOR THE ENSUING WEEK.

Mon......Society of Arts, 8. Cantor Lecture. Mr. Hullah, "On Music and Musical Instruments."
Odontological, 8.
Farmers' Club, 5½.
Society of Engineers, 7½. Mr. Vaughan Pendred, "On Water Tube Boilers."
R. United Service Inst., 8½. 1. Capt. G. V. Fosbery, V.C., H.M. Bengal Army, "Explosive Shells applied to Military Purposes." 2. Mr. Evan Hopkins, "On the Demagnetization of Iron Vessels." The process will be shown by means of a model illustrating operations on H.M. ship *Northumberland*.
Royal Inst., 2. General Monthly Meeting.
Entomological, 7.
British Architects, 8. Annual Meeting.
Medical, 8.
Victoria Inst., 8.
Tues ...Civil Engineers, 8. Mr. James T. Chance, "On Optical Apparatus used in Lighthouses."
Pathological, 8.
Ethnological, 8.
Geologists' Assoc., 8.

R. Horticultural, 3. General Meeting.
Royal Inst., 3. Prof. Blackie, "On Plato."
WED ...Society of Arts, 8. Captain O'Hea, "On the Recent Inventions and Improvements in European and American Breech-loading Small-arms."
Geological, 8.
Graphic, 8.
Microscopical, 8. 1. Dr. L. Beale, "On Nutrition from a Microscopical point of view." 2. Dr. L. Beale, "On the Germinal Vesicle of the Ovarium Ova of the Stickleback." 3. Mr. J. H. Brown, "On an Iris Diaphragm."
Literary Fund, 3.
R. Society of Literature, 8½.
Archæological Assoc., 4½. Annual Meeting.
THUR ...Zoological, 8½.
Royal Society Club, 6.
Royal Inst., 3. Prof. Huxley, "Ethnology."
London Inst., 7. Prof. Bentley, "On Botany."
Antiquaries, 8½.
Royal, 8½.
FRI ......Astronomical, 8.
Royal Inst., 8. Prof. Bain, "Correlation of Force in its bearing on Mind."
R. United Service Inst., 3. Captain Cortland H. Simpson, R.N., "His Plan of Sustaining and Lowering Ships' Quarter Boats."
SAT ......Royal Inst., 3. Prof. Huxley, "Ethnology."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb.

Delivered on 13*th April*, 1867.

91. Bill—County Treasurers (Ireland).
114. „ National Debt.
190. Duchy of Lancaster—Account.
220. Navy (Corporal Punishments)—Return.
228. New Courts of Justice—Estimate.
Servian Jews—Correspondence.
Public Petitions—Seventeenth Report.

SESSION 1866.

422. (A IX.) Poor Rates and Pauperism (Return A).

Delivered on 15*th April*, 1867.

212. Coal Duty (London)—Returns.
218. Spirits—Returns.

SESSION 1866.

511. Income and Property Tax—Return.

Delivered on 16*th April*, 1867.

189. Passengers' Baggage (Paris Exhibition)—Further Correspondence.
210. Supplemental Estimates—Account.
219. College of Science (Dublin), &c.—Return.

SESSION 1866.

489. National Debt—Return.

Delivered on 17*th April*, 1867.

110. Bill—Arrest for Debt Abolition (Ireland).
175. (I.) Savings Banks—Returns.
191. East India (Native Troops)—Minutes.
206. Storm Signals—Memorials.
222. Constabulary (Devon and Somerset)—Return.
221. Constabulary (Cornwall)—Return.
236. Sugar—Return.

Patents.

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From Commissioners of Patents' Journal, April 26*th*.

GRANTS OF PROVISIONAL PROTECTION.

Advertisements, apparatus for exhibiting—1084—J. Dunbar.
Armour plating—1082—T. A. Rochussen.
Bale-fastener—1036—T. H. Lucas.
Blowing engines—1072—A. C. Kirk.
Boats—996—T. Faucheux.
Boilers—756—T. Cowburn.
Boilers—809 - J. R. Swann.
Boilers—1028—W. E. Newton.
Bricks—1006—W. Hodson.
Bronzing metallic surfaces—979—J. Storey, W. E. Bickerdike, and W. V. Wilson.
Buckles—1074—R. Couchman.
Butter—218—E. H. G. Monckton.
Cartridges—1002—E. Delessert.
Chlorine—1054 – C. F. Claus.
Collars, &c.—612 – J. E. Smith.
Cotton gins—1068—A. V. Newton.
Dead bodies, preservation of—1044—W. R. Lake.
Doors—1043—J. Barker.
Fabrics, textile—1088—W. Robertson and J. G. Orchar.
Fibrous substances, treating—1034—W. P. Butchart.
Fire-arms and cartridges—972—J. Lewis and G. Clark.
Fire-arms, breech-loading—3325—J. Macintosh.
Fire bars—1070—W. C. Cambridge.
Fire-extinguisher—1014—E. Casper.
Fire grates—1061—T. Redmayne and J. Sibrey.
Furnaces—1076—S. Barlow and T. Edmeston.
Gas—608—H. Ulliel.
Ice—952—W. E. Newton.
Jacquard machinery—1052—C. E. Brooman.
Milling machines—1004—J. H. Barker.
Motive-power—1008—H. Davey.
Motive-power machinery—984—J. A. Moll.
Oxygen, producing—1040—C. E. Brooman.
Petroleum, &c., burning—998—J. A. Bouck.
Phosphorus—1064—J. H. Player.
Pumps—1026—S. Matthews.
Railway crossings—1012—S. Perkins.
Railway sleepers—1086—H. A. Bonneville.
Railways, &c.—1016 - B. Fowler and D. Greig.
Railways, &c.—1056—R. A. Rooney.
Shells, &c.—1050—W. E. Newton.
Smoke-purifier—1058—J. L. Davies.
Spindles, &c.—1030—F. A. Fitton and T. Hall.
Telegraph posts—1048—W. T. Henley.
Telegraph wires—1022—T. B. Marshall.
Thread, &c., winding—1060—A. Morel.
Tubes—753—N. Thompson.
Valve seats—1066—J. R. Napier and W. J. M. Rankine.
Vermin traps—1080—W. Clark.
Wearing apparel—1020—S. Leather.
Weighing-machines, &c.—584—R. Wilson and W. H. Bailey.
Whetstone—1000—G. E. V. Derburgh.
Wire—1049—W. T. Henley.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Bricks—1078—W. R. Lake.
Furnaces—1153—W. Harrison.

PATENTS SEALED.

2758. D. McDermid.
2771. J. H. Gresham.
2774. F. Crossley.
2782. C. Tiffin.
2788. C. McBeath.
2790. J. H. Johnson.
2793. E. Alexandre.
2796. P. Adie.
2797. J. Hunter.
2799. H. Wedekind.
2802. J. Varley.
2808. H. M. Nicholls.
2833. J. Becker.
2835. M. Pollack.
2838. J. Deas and R. C. Rapier.
2848. F. A. Calvert.
2874. J. H. Johnson.
2941. R. Lakin and J. Wain.
2943. J. H. Johnson.
2944. J. H. Johhson.
2952. D. Murray.
2956. J. Bentley & W. Hampson.
2967. W. S. Macdonald.
3129. H. Timmins.
3169. M. A. F. Mennons.
3232. T. Gray.
3320. F. N. Meixner.
3449. C. F. Flach.
8. G. B. Woodruff and G. Browning.
78. M. H. Simpson.
400. J. Westwood and R. Baillie.
401. J. Westwood and R. Baillie.
504. I. M. Milbank.
613. G. Haseltine.
2785. M. and A. D. Hopkins.
2798. J. H. Johnson.
2814. W. Robertson.
2815. J. Dodd.
2816. J. Scott.
2818. J. Scott.
2820. J. Keighley.
2822. R. Holden.
2829. T. Henderson.
2830. J. Jackson.
2854. R. McTaggart and J. Holdforth.
2911. R. J. Edwards.
354. H. E. Falk.

From Commissioners of Patents' Journal, April 30*th*.

PATENTS SEALED.

2832. E. Tavernier and H. W. Whitehead.
2834. H. R. J. Denton.
2844. R. Porter.
2846. O. C. Edwards.
2847. J. Harris.
2850. R. J. Gay.
2858. F. Claudet.
2861. M. Chamberlain.
2863. J. S. Gisborne.
2865. T. D. Clapham.
2866. C. E. Brooman.
2873. N. F. Taylor.
2878. T. Hunt.
2880. C. E. Spagnoletti.
2887. W. Humphrey.
2888. J. Shaw.
2901. C. Sutton.
2914. T. Horsley & G. Knighton
2919. W. Cassap.
2946. W. Clark.
2960. A. Hawkins.
2964. L. Brierley.
2978. J. Whitehead.
3034. T. Greenwood.
3073. W. R. Lake.
3228. W. Clark.
3308. W. Clark.
3405. W. Clark.
46. W. E. Newton.
237. P. Jack and A. Coulthurst.
248. T. C. Entwistle.
425. J. Lamble.
544. S. Butler.
550. A. V. Newton.
570. A. V. Newton.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

1012. G. Davies.
1261. G. Homfray.
1039. H. Marsden.
1048. F. Bush.
1108. A. V. Newton.
1214. G. T. Bousfield.
1076. R. H. Smithett and J. Davidson.
1072. T. G. Ghislin.
1095. R. A. Rrooman.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

1226. W. Geeves.
1017. E. Hillam & R. R. Wilson.
1083. H. Rawson.
1089. H. T. Green and S. B. Wright.
1064. J. Bullough.